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Originating the Index Wheel of the Cornell Dividing Engine.

BY H. B. M'CABE.

The descriptions which have recently appeared in the "American Machinist" of different methods of producing accurate dividing wheels bring to my mind the Cornell dividing engine, built by Geo. F. Ballou, and described by him in the "American Machinist" for March 28 and April 11, 1895. The carriage carrying the marking tool of this machine was moved by means of a very accurate lead screw. On one end of this lead screw was keyed a cast-iron wheel with the rim turned all over very true and smooth. This wheel was to be turned a certain portion of a revolution after each division mark had been made on the work, to bring the tool in position for the next one. The device employed to do this is extremely ingenious and is probably original with Mr. Ballou and Professor Rogers, for whom Mr. Ballou built the machine.

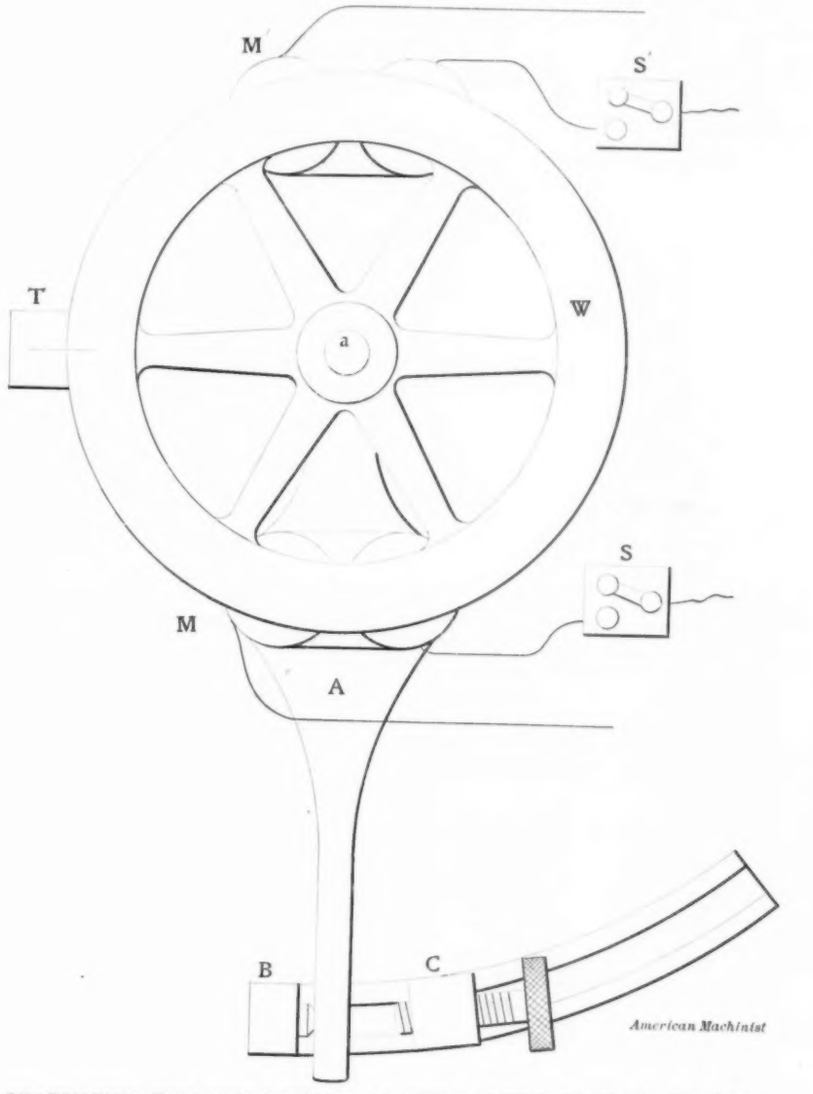
A ratchet and pawl arrangement would naturally suggest itself to one's mind as a starting point, the cast-iron wheel having ratchet teeth cut in the rim, one pawl being, perhaps, on a vibrating arm journaled on the screw and in position to engage the ratchet, and the other on a stud solid in the frame. But instead a magnet, with its poles in position to always be in contact with the true rim of the wheel, took the place of the first pawl, and a second magnet in like position with respect to the wheel, but fast to the frame of the machine, took the place of the second pawl.

In connection with the magnets were, of course, provided proper switches and batteries.

With this device Mr. Ballou divided the periphery of the wheel into exactly 100 divisions, marked with a diamond on a strip of silver inlaid in the surface of the wheel rim. The sketch I send will, I think, give a clearer idea.

A is the vibrating arm and *M M'* the magnets. *B* and *C* are two stops for *A*, *C* being adjustable. *S S'* are two switches to open and close the circuits. During the forward motion of *A*, magnet M grips the wheel *W* firmly, carrying it a portion of a revolution determined by stop *C*. Magnet *M'* then grips *W*, and *M* lets go, and *A* goes back to stop *B*.

We might have a block *T* fast to the frame and in the position shown, on which a fine line for a starting point might be drawn, and continued across the surface of the rim. When *C* is set for *A* to carry *W* a certain division of a circle, the lines will exactly match again after the proper number of movements have been given to *A*. The correct position of *C* is found by a succession of trials.



GRADUATING THE INDEX WHEEL OF THE CORNELL DIVIDING ENGINE.

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The financial statement presented at the last meeting of the stockholders of the Manchester Ship Canal showed that the prospects of the enterprise are improving. The canal portion of the enterprise now yields a small net revenue. The new Canadian steamship line will make use of the canal.

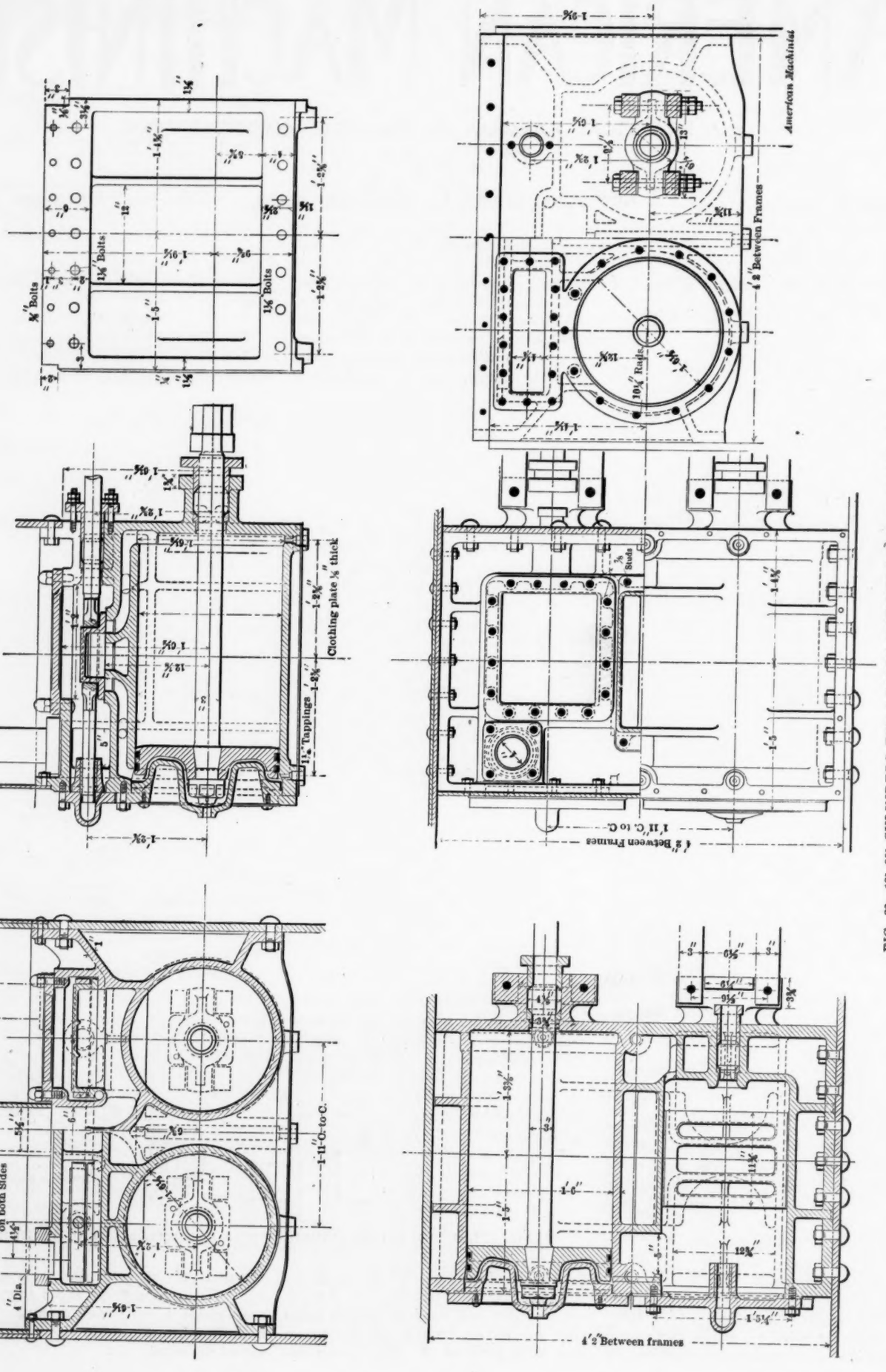

FIG. 30.—18"x26" CYLINDERS FOR "GOODS ENGINES," L. & Y. RAILWAY.

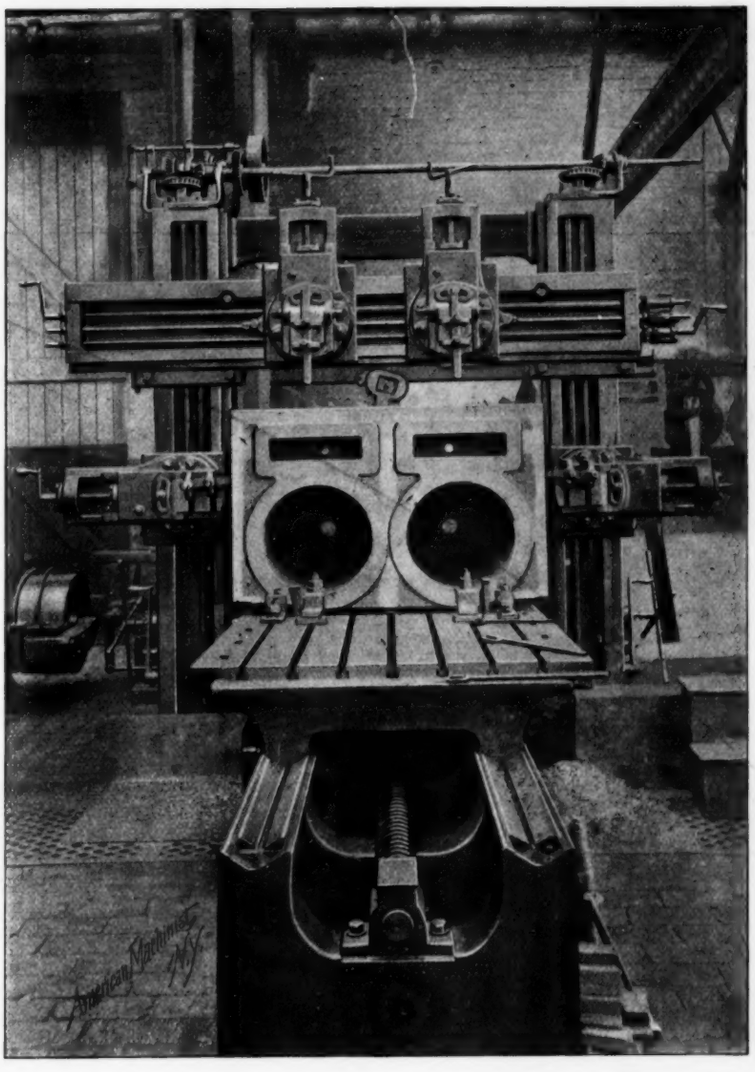

FIG. 31.—PLANING CYLINDERS.

Boring and Finishing Cylinders in the Horwich Shops of the Lancashire and Yorkshire Railway.

Having given a general account of the Lancashire & Yorkshire Railway shops at Horwich in two previous issues, it now remains for me to close the story with an account of a special machine shop operation carried on there which differs in some respects from any other I have seen elsewhere.

We have in previous issues given accounts of the practice of a number of our American shops in finishing cylinders. The methods pursued at Horwich differ radically from any that we have shown, and in fact from any American practice; primarily, of course, because the cylinders are so totally different in design that the methods followed with our cylinders would be inapplicable to theirs. Our shops have in many cases developed their cylinder finishing methods "to the limit," but I believe an inspection of the accompanying drawing of a pair of 18x26 inch cylinders for a freight engine and the photographs illustrating its progress from a mere casting to a finished piece, ready to take its place as one of the most important parts of a locomotive, will prove interesting, and will show that Mr. Aspinall has gone about as far as it seems possible to go in facilitating the various operations and in avoiding the possibility of anything going wrong during the process.

The drawing, Fig. 30, shows the construction of the L. & Y. standard cylinders very clearly. The plate-frames are bolted to this casting, one on either side, as shown in the view at the lower left-hand corner of Fig. 30, and the boiler is attached to the same casting by the lower edge of the flanged head, which is best seen in Fig. 29 (shown last week), and which is fastened by bolts to the seat provided for it, which seat is shown at the extreme upper right hand corner of Fig. 30 and also in the plan view at the lower center of the same figure.

Outwardly the cylinders take the form of a rectangular box, and this first goes to the planer seen in Fig. 31, where four tools operate simultaneously to plane it to dimensions, special gages being provided to bring it just right. Not only the three sides shown as being operated upon in Fig. 30, but also the faces of the bosses which are afterward drilled and tapped for the cylinder cocks are planed carefully to dimensions.

The cylinder then goes to the machine shown in Fig. 32, which has four boring-bars and on its base planed seats, into which the planed cylinder fits and is thus surely located precisely both vertically and laterally—without the possibility of a mistake. The four bars then bore simultaneously the four holes for the piston rods and valve stems and for their stuffing-box glands. The machine is very simple and has evidently been designed and built solely for this particular work.

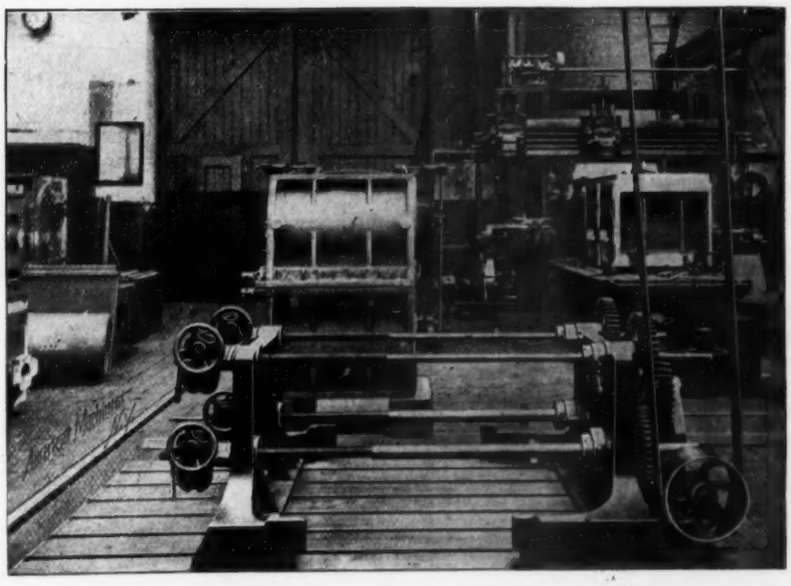

FIG. 32.—MACHINE FOR BORING HOLES FOR PISTON RODS AND VALVE STEMS.

The feed is by means of a thread cut on the bars themselves, and though I do not certainly remember the exact construction, I think there is a nut which is released and allowed to revolve with the bar when not feeding and is held from turning by a suitable clamp when the feed is desired. The small hand-wheels probably rotate the nut for hand movement of the bars, as in setting a cut, or running back. The cylinders when in this machine rest upon and are located vertically by the previously planed bosses for the cylinder cocks.

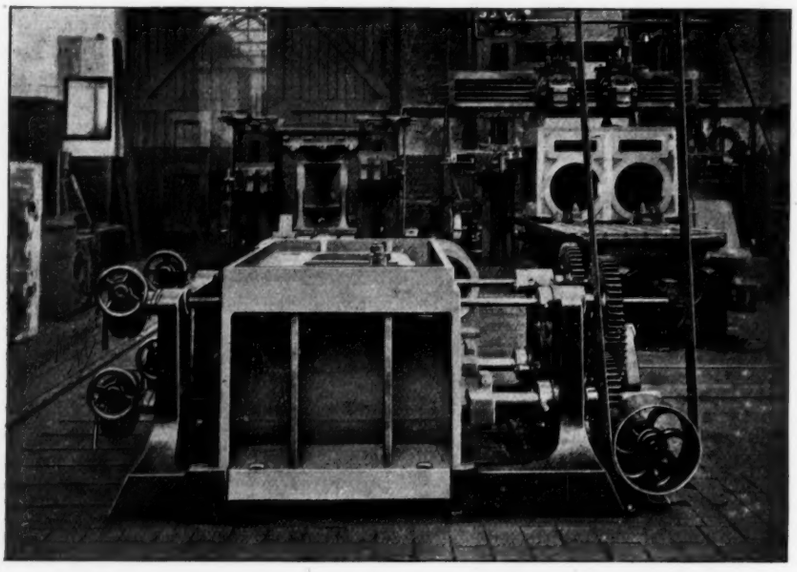

FIG. 33.—PISTON ROD AND VALVE STEM—HOLES BEING BORED.

The next operation is to bore the cylinders proper, which is done on the machine shown in Fig. 34. This machine has two bars which are fixed at the correct distance, center to center, and each is provided with a sliding head having three tools. The outer ends of the bars run in bushings which are inserted in the previously bored holes for the stuffing-box glands, as shown in Fig. 35, where a pair of cylinders are shown in process of boring. It will be noticed that by this arrangement the cylinders themselves form the outboard bearing for the boring bars and the machine is reduced to the simplest possible elements. The lower bar is driven by worm gearing and the upper one by spur gears from the lower. The feed mechanism is by the familiar star device.

In the lower left-hand corner of Fig. 35 is seen a portion of another boring head not in use. It will be noticed that the slots for the cutting tools are not put in radially, as is too often done in our own shops, apparently under the mistaken notion that such a head is really a milling cutter; and the further mistaken notion that, therefore, the tools need no top rake, but can as well push and jam off the metal instead of cutting it, as they, of course, should do. Why our boring heads are so often made with radial slots for the tools, and then time and patience expended in grinding hollows on the top faces of the tools to give them rake and a cutting edge, is to me an unfathomable mystery. Made as shown in this view no grinding needs to be done except upon the ends of the tools where only it should be done.

At Fig. 36 is the final operation of drilling, tapping and studding. The machine in this case is by Wm. Muir & Co., of Manchester, and the tapping and stud screwing device shown in use is, I think, made by Smith & Coventry, of the same place. Its principle of action is to drive by means of an interlocking clutch with the locking faces made at such an angle that they would force themselves apart were it not for the pressure of the helical spring shown, which holds them together until by the bottoming of the tap or stud the resistance becomes abnormal, when the clutch is allowed to slip. The valve-face and ports seen in Fig. 36 are milled upon a vertical spindle machine, of which I have no photograph.

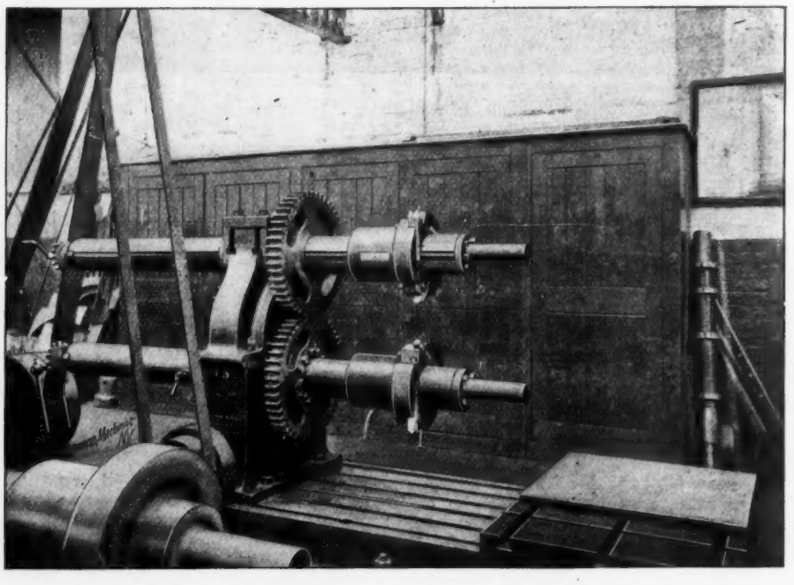

FIG. 34.—DUPLEX CYLINDER BORING MACHINE.

The processes here outlined may be said to be in the reverse order of the usual machine shop practice in finishing cylinders, the boring being almost invariably the first operation and all subsequent planing and other work done with reference to it. A good while ago, in an American shop, I had something to do with an elaborate system of tools for finishing the cylinders of stationary engines. They were arranged to be first bored and the counterbores were carefully gaged to standard sizes. Angle-plates were made in pairs, with disks on their vertical faces fitting these counterbores, and the tops of the angle-plates were fitted with hardened steel pieces representing the hights of the various surfaces to be planed and the exact location of all shoulders as well. The cylinders were simply rotated on these disks to the different positions required and the various surfaces planed in accordance with the hardened steel gage pieces. This outfit of tools, together with others of similar character used throughout the engine, produced strictly interchangeable parts, and in erecting no line was ever needed through the cylinder. The parts simply could not go together otherwise than right. Whether it is best to bore before planing or afterward in manufacturing cylinders is an open question perhaps, but it is an interesting fact that Mr. Aspinall makes an entire success of the operation by revers-

ing the usual procedure. The admirable simplicity and high efficiency of the methods shown are but representative of the entire establishment. Good work is done throughout and it is done by very advanced methods. F. J. M.

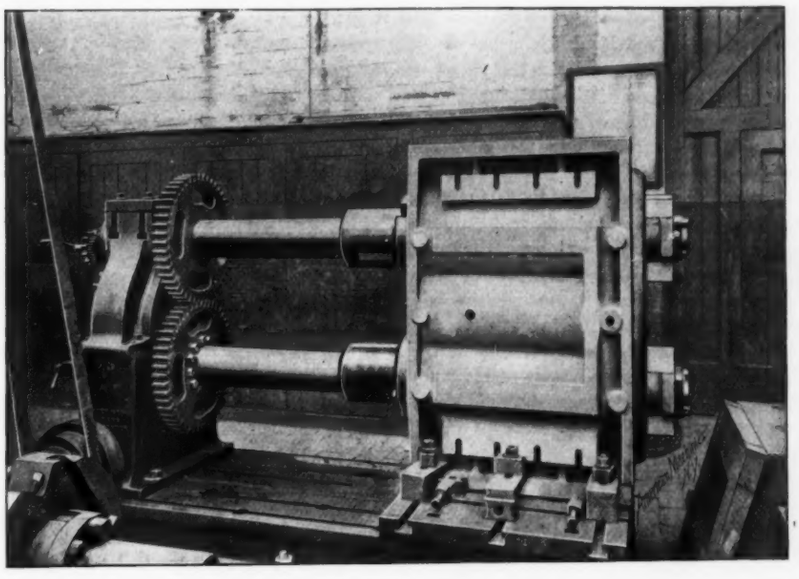

FIG. 35.—CYLINDERS BEING BORED.

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The Educational Value of Machine Shop Operations.

Prof. C. P. Benns, of the Teachers' College, New York, has, in addition to a technical education, served a regular apprenticeship to the machinist's trade, and has worked as a journeyman machinist. He is a believer in the educational value of properly conducted machine shop operations, and at the recent meeting of the American Manual Training Association, held in Washington, Professor Benns read a paper with the above title, from which we abstract as follows:

There is a very widespread idea, but an erroneous one, that since the machine shop deals with machine tools there can be no great mental effort involved in their operation. It was once said to me: "You set the machine and by virtue of its construction it goes straight and true to the desired end." That this view is incorrect is demonstrated in a very few moments of actual contact with the machine tools in question, but I think that one unfamiliar with these machines will be able to find the error by reasoning from the analogies of familiar things.

The modern machine tools are wonderfully complex, and just as it is more difficult to control a large body of men with their enormous strength or capacity than to handle a few with their limited power and resources, so as the power and capacity of the tools increase, the intelligence and skill necessary to their complete control and utilization of their resources must increase also.

We often hear it said with a wail that there are no more such machinists as there were in the olden times—men of brains and muscle, who could accomplish with few and simple tools deeds that now require the large investment in heavy tools and equipment. It is true that there are no more of that type, but that is no loss and no just criticism on the achievements of the present, any more than it is a just criticism or that it is to be deplored that the wives and daughters of to-day cannot spin and weave the fabric of their clothing. The old-time machinist, with his hammer, chisel and file as his principal tools, filled his place nobly and made possible the higher attainments of later years. Modern times call for a different kind of man and one possessed of very different attributes.

Intellectual activity may be said to be the leading characteristic of the modern worker with machine tools. This is an age of specialization—it is an age of mechanism—and along no lines has specialization gone further than in the direction of machinery. In this process of specialization there has been employed a class of men who are to all intents and purposes

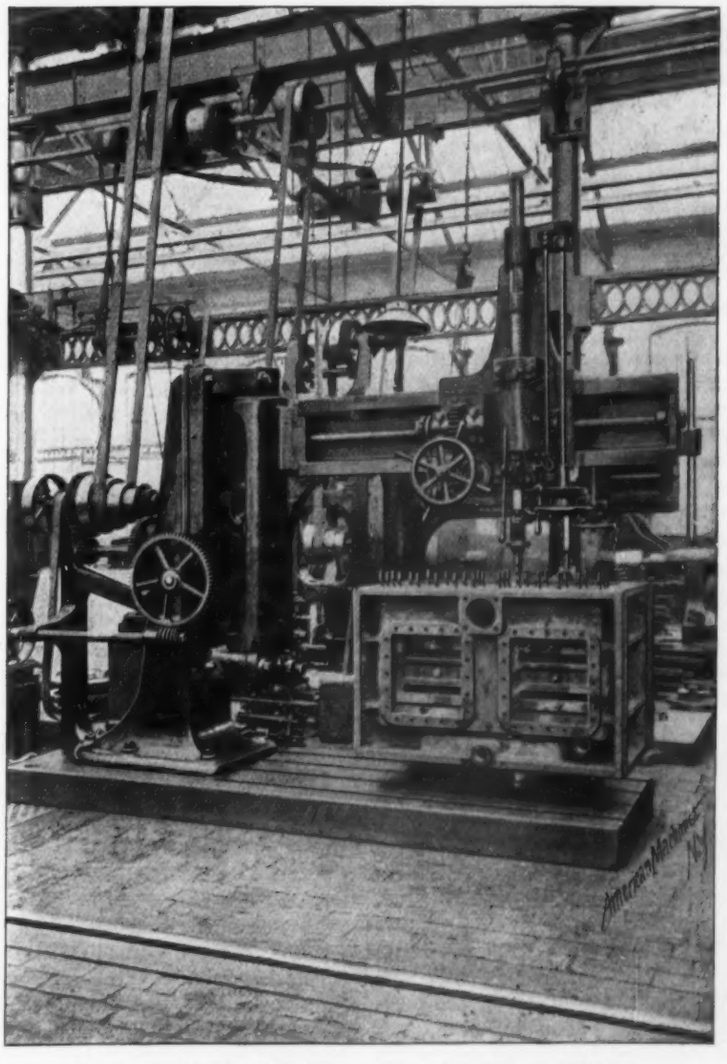

FIG. 36.—DRILLING, TAPPING AND STUDDING CYLINDERS.

integral parts of the machines they operate, and many times when one speaks of the modern machinist being a thinking, intelligent man, one is met with the example of one of these machine operators.

These operators must, however, be directed and controlled by someone who has not only mechanical skill and experience, but brains. One goes into a shop and sees the machines running apparently automatically, and there certainly does not appear to be much mental effort required to simply watch the machine do its work. There could be many cases cited where the periods requiring mental activity might be separated by long intervals, during which the mechanism of the machine would take care of itself, and obviously where we are after the mental side of the work such processes would not be suited to our purpose.

An arrangement of work on an educational basis must take into account the mental conditions necessary to attain the result—that is, the sequence of exercises must be based on these mental conditions rather than on a widely varied use of a given tool or on the use of a great number of machine tools. Here, it seems to me, is a very competent reason for differentiating the manual training course from that of the technical school. In a good technical course the various machine tools should be considered in the light of their adaptability to the purposes for which they were designed, and the student's contact with these tools should be such that this adaptability shall be most strongly emphasized.

In a course for manual training purposes the exercises should have the mental side as a working basis, and it may well follow that the sequence of the use of different machines or of the order in which operations may be performed on the same machine may differ entirely from that suited to a technical course. This is my reason for feeling that manual training has suffered at the hands of the technical schools.

I wish to emphasize the constant and intense mental activity that can be called for by a well-arranged course in machine tool work. A boy comes to the machine shop and probably the first thing he is required to do is to study his machine in a general way, start and stop it perhaps. Now it is perfectly natural to look at the machine in a vague fashion, being conscious that certain parts are moving while others are stationary, and that the machine appears to be provided with a number of handles and levers, which seem wholly unnecessary to its operation. This first attitude is just as different from the one which is necessary to the adequate study of the machine as is the layman's general view of a landscape different from the view of the trained artist, who takes in not only the whole, but analyzes it and is impressed by all the details and subtleties of color, light and shade. A more careful study of the machine of course brings up the questions Why? and How? and I know of no class of work which brings out more conspicuously the relation between cause and effect than this examination of machinery.

Considerable time might be spent to great advantage in simply making a critical examination of the mechanism of the different machines, but this does not make pieces which show on the exhibition day, and our boy goes to cutting iron in a blind fashion long before he understands, even in a general way, the tools of which he must make use. Aside from the lack of wisdom in putting the tool into active use before the mechanism of it is understood, we deprive the boy of one of the very important features of his training—that is, the opening of the door of his understanding to the world of mechanism in which we live.

Suppose we have given sufficient time and attention to the matter of studying the tool as a piece of mechanism. What next? Here we encounter one of the inherent difficulties of this class of work; we must find some operation sufficiently simple to be easily grasped and yet fundamental, so that subsequent work can be based upon it. It seems as if the usual starting piece of lathe work (a simple cylinder) affords probably the most logical point at which to begin. The first operation is that of finding the centers of the rough ends of the piece and finally of making permanent conical holes upon which to turn the piece. Various methods may be used for finding these centers, and it is quite wise to adapt the method not only to the individual characteristics of the piece of stock, but to the mental attitude of the boy. That is if there was a boy in the class who was quick and keen to see and observe, who had therefore what we call a good eye for measurements, it would be very proper and for his best good to allow him to use a method different from the one suited to a rushing, careless, "that's-good-enough" sort of fellow.

The question of the economical use of the student's time is an all-important one, for we must view the material result of the work in the light of its cost in time and labor. Many attractive things can be made as a machine shop product, but their cost in time and labor is out of all proportion to their educational value. To the general eye a piece of machine work, bright and highly polished, is a very attractive thing, and in many cases this quality of attractiveness is the only one which can be found to commend it. In judging of the excellence of machine work one is very apt to unconsciously take the mistaken ground that the highly polished surface indicates the best workmanship and has required the greatest amount of care in its production. As a matter of fact, the polish is merely a superficial indication, and is often used as an attempt to cover up poor work by the glitter of high finish. Many times pieces have in the process of polishing lost entirely anything of the student's individuality they may have contained, and therefore are valueless to indicate the mental process gone through or the mental condition of the student. * * *

It is sometimes surprising to see how readily the hand responds to the guidance or direction of the mind. I have yet to fail to see the hand respond to the commands of the mind where there was a clear conception of every detail of the operation. Of course, if the idea of what is to be accomplished is vague, the directions sent to the muscles will be of a very general character and the result may be only a remote approximation to the one desired. Take, for instance, a boy learning to file. He knows simply that he wants to have the piece flat, but instead of that it is rounding—convex. He might practice for months and, until his mental condition changes, the piece would be still be filed convex. Just as soon, however, as he becomes conscious that at each stroke of the file the ends must go up and down, if he is filing convex, his difficulties decrease. When next he discovers that there is a very different feeling whether the file is laid on a flat surface or on a rounding one, the result is practically attained, and no further difficulty should be encountered in handling the file. * * *

In manufacturing it has been found that a certain degree of accuracy is consistent with keeping the cost of the articles within such limits as will permit of sale at a reasonable price. It has also been determined that a small increase in the degree of accuracy in workmanship necessitates a disproportionate increase in the cost. On this account it is recognized that there is a great difference between the highest attainable accuracy and what is known as commercial accuracy, commercial accuracy meaning that degree of accuracy which best satisfies these existing conditions. For example, two large lathes were built a few years ago by a prominent maker, both from the same patterns and by the same workmen. One cost three times as much as the other. One was built with commercial accuracy, the other was required to pass all of an elaborate series of tests prescribed by the purchaser, which were calculated to insure his receiving a lathe built with the highest degree of accuracy. Here was a case where a man was willing to pay what would have ordinarily been an exorbitant price for a lathe which would have a few thousandths less variation than a similar lathe built on commercial lines. But this is wholly exceptional, and had the manufacturer insisted on building only lathes of this grade his business would have been far from extensive. We have all heard of the marvelous accuracy necessary for the

production of machinery on the interchangeable plan, sewing machines, guns, pistols and watches. It is somewhat surprising, however, that these things are comparatively inaccurately made to what they could be if made by skilled men and one at a time. The inaccuracies are in all cases recognized and confined to narrow limits; so narrow that, though present, they have no detrimental effect on the machine as a whole. It is rather the eternal vigilance that recognizes the unavoidable variations and keeps them under control which should awaken our pride and enthusiasm. * * *

Machine shop work does not lend itself readily to extremely elementary work, and its actual position near the end of the course is undoubtedly correct. After students have had two or three years' training in the drawing-room and in wood working they should be well prepared to take the forward step to the metal work. For instance, after a boy has had some practice in mechanical drawing and has learned to lay off diagrams or outlines, using the hard chisel pointed lead pencil and a nicely graduated wood scale, he will surely appreciate the difference in requirement when he comes to lay off some form on a surface of blackened zinc with a marking point that is sharp, and measuring with a steel scale with fine deep graduations. Differences in intersection or measurement that could not be detected upon paper when lines are drawn with pencil, now stand out in bright, clear lines from the blackened surface. This is because the finest line that can be clearly drawn with a pencil is probably about .005 inch in width, while it is perfectly feasible to draw a line on the zinc whose width shall not be more than three-quarters of one one-thousandth. To meet these requirements we have increased facilities in the marking point and the finer lines on the steel scale. On the ordinary draftsmen's scale the lines are usually not less than .01 inch wide, and the edges of the scale itself are more or less irregular, while the steel scales sometimes have lines as fine as .002 inch, and these fine lines run out to a smooth, clean edge. The care necessary to produce a good drawing on paper would produce only a fair result on the zinc, so that here we can take a decided step forward where due preparation has been made.

With such possibilities in the degree of accuracy, the danger is great that the matter may be overdone, and the limits should be very carefully fixed, having due regard to the nature of the operation and the probable capacity of the average student at the time the work is performed.

There is need of men who can think and act promptly, unhesitatingly and with sufficient accuracy for the matter in hand, but it seems sometimes as if the manual training accuracy that we require tends rather to produce a state of mind that requires painful halting action wherever a result is to be attained with any degree of accuracy.

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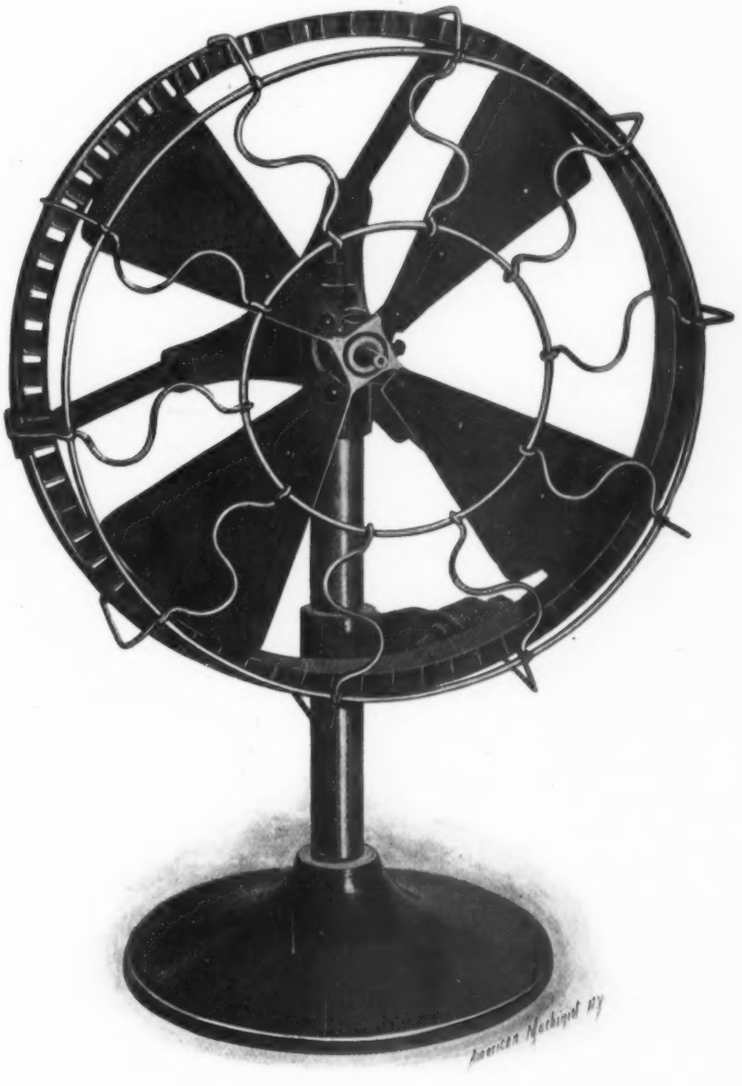
A Fan Driven by Compressed Air Jet.

Editor American Machinist:

I send you herewith a photograph of what I thought was going to be a good scheme for a blowing fan for ventilating rooms where compressed air can be had. It works perfectly. You will notice I have made a ring around the fan blades and introduced in that ring proper shaped buckets for impingement of the air jet, which you notice is behind the fan. This air jet is 1-32 of an inch in diameter, and we use it under a pressure of 80 or 90 pounds. The wheel is 12 inches in diameter and makes 3,000 revolutions. The buckets are so shaped that the resultant air leaves the buckets in a line parallel to the axis of the wheel, so that it does not disturb the current which the fans propel. This air coming from the jet and after working on the wheel is considerably cooler than the other air, and it acts not only in furnishing a considerable volume of air, but it also has the advantage of cooling it. But the thing is a failure, perfectly as it works, for it screams louder than the American eagle ever did, with a shrill, siren tone which is ear-piercing. I have tried in three or four ways to get rid of that sound, but I have given it up. Perhaps some of your compressed air friends can suggest a remedy.

E. A. RIX.

San Francisco, Cal.



FAN DRIVEN BY COMPRESSED AIR.

[The jet by which the air is driven will be noticed at the bottom, a little to the right and behind the fan. The air, it will be seen, blows through the rim of the wheel, and thus makes a very complete siren. Why could not the jet be made to blow into closed pockets instead? The noise would thereby be pretty certainly reduced, but it might not all be eliminated.—ED.]

Foreign News Notes.

A semi-official organ of the German Government has published a memorandum on the registration of trade marks in Germany under the law of 1894, and reminds all persons who have registered trade marks under the law previous to that of May 12, 1894, that no further protection will be accorded to those marks after October 1, 1898, unless the owners shall have re-registered them in conformity with the said law of 1894, which provides that such re-registration shall be effected by October 1, 1898, and would then be free of further fees for the registration expenses. It further points out that, in cases where this has not been done up to October next, a suspension of protection of the marks would ensue from that date until the properly effected registration. Manufacturers who have neglected to take these steps should at once effect the necessary registration in Germany.

The four years' period till October this year was fixed not only to secure acquired rights, but also because it was impossible in a shorter space of time to examine them and see if they corresponded to the regulations of the new law. It will only be from October 1, 1898, that the trade mark law of 1894 will come into full force in Germany.

There has been a slight decrease of importations of machinery into Spain during the past year, amounting to about 15 per cent.

Reports show that there has been a general increase in the import trade of China during the past year of about 17 per cent., and for the first time in their history bicycles figure to a considerable extent, amounting to about $50,000. Our American machines were the first in the field, but it would be well to recognize the fact that we have a formidable rival in British manufacturers, many of whom have already established agencies in that country.

There is reported to be a very brisk trade at the port of Chefoo in metals, especially in old and scrap iron, most of it being carried to either Hong Kong or Shanghai as ballast, from whence it is carried by tramp steamers to Chefoo.

It is acknowledged on many sides that the British locomotive builders are finding every year that American builders are more and more formidable competitors for that class of trade. Up to a very recent date British manufacturers controlled this trade in South Africa, in the East and in South America. It is not so very long ago, however, that American builders secured orders for seventy-seven locomotives for China, although it has since been claimed that forty-eight out of the seventy-seven were subsequently placed in England.

A British contemporary contains a brief account of an electric fire engine that has lately been invented in Indianapolis. The report states that the engine is made of a rotary pump driven by a small electric motor and mounted on a reservoir. The pump draws the water from a hydrant, cistern or stream in the same manner as a steam engine, and forces it into the reservoir. Leading from this reservoir are a number of nipples, to each of which may be attached a line of hose. The wires by means of which the electricity is conducted to the engine are wound on a reel mounted near the motor in such a way as to permit them to be readily drawn off and attached to any suitable source of power, such as trolley wires, electric light wires or established stations for this special purpose. The advantages claimed for the new engine are compactness, lightness and the greater efficiency secured by being able to utilize a larger number of streams from a single engine.

The general outlook for business in New South Wales is favorable, the seasons are better and crops are good, and as a result general business tendencies are improving and American dealers are enjoying a fair share of the increased prosperity. Increasing sales in hardware and light machinery are being reported. American manufacturers have secured the contracts for the new street railways in Sydney, and have stipulated for the supply of 2,000 tons of steel rails for the new lines.

The world's progression in railways during the past thirty years has been simply wonderful. During the twenty-five years between 1870 and 1895 there has been an increase in the length of railways in Great Britain and Ireland of 9,000 kilometers; Russia has increased her lines to the extent of 24,500 kilometers; Germany by 27,624 kilometers; France by 22,486; while here in the United States we have added 207,000 kilometers, or nearly eight times as much as Germany, twenty-three times more than Great Britain and over twice as much as all the countries named put together.

A. F. TENNILLE.

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Hydrofluoric Acid for Pickling Iron Castings.

Hydrofluoric acid seems to be rapidly superseding sulphuric acid for removing sand from castings. The action of the two acids is essentially different; sulphuric acid acting upon the iron and eating it away from under the sand, leaving the sand free to drop away or to be washed off, while hydrofluoric acid dissolves the sand, with comparatively little effect upon the iron. Much less acid is therefore used and the action is more rapid.

The acid (30 per cent.) is shipped in wooden barrels holding about 300 pounds or in lead carboys boxed in wood holding 100 pounds. The acid should be emptied from the barrel as soon as possible into a lead lined tank or one well coated with asphaltum. The usual strength of the pickle is 20 to 25 of water to 1 of the acid, the latter being poured into the water and well stirred. Experience may suggest different proportions for the pickle for different lines of work. This pickle will clean ordinary castings in one-half hour to one hour. The bath can be used repeatedly by adding more acid. It is used cold, but should not be allowed to freeze. The castings when taken from the pickle are washed or rinsed in hot water if necessary to keep bright, or if washed in cold water they may rust the same as if otherwise wet, as they, of course, dry slowly. A little lime may be added to the water. The use of rubber gloves is recommended for men who use the pickle. If the acid touches the skin it should be washed at once with water and diluted ammonia. Hydrofluoric acid also dissolves more readily than sulphuric or muriatic acids the ordinary rust and magnetic (black) oxide or scale that forms on the surface of heated iron. We gather the above information chiefly from a recent letter in "The Foundry."

▲ ▲ ▲

A New System of Gages for the Planer.

By the courtesy of the Bullard Machine Tool Company, Bridgeport, Conn., we present herewith an engraving of a gaging appliance in use in the works of that company which we believe to be new. It is certainly unusual as well as highly meritorious.

The gage is intended for the three slots of boring machine tables, in which chuck jaws are inserted. For reasons of interchangeability as well as economy of production, it is obviously desirable that these slots be uniform, and this the device secures with a minimum of labor.

The boring mill tables to be slotted come to the planer with the lathe work completed, and with a concentric hole through the center which enables them to be mounted upon a post having a tongue fitted to the planer table slot in such a manner that the work shall be in line with the slot. On the front end of the planer table is bolted the bracket casting shown in the figures. This casting has a tongue at *a*, Fig. 1, fitting into the planer slot. The initial or plug gage for the chuck jaw groove is seen at *b*, Figs. 1 and 3, where its shape will be seen to be that of the groove to be made. It has a tongue *c* fitting into a corresponding groove in the bracket casting and is held in position by the knurled headed bolt *d*. The bracket is composed of two pieces arranged to slide vertically upon one another at *e*, Fig. 2, whereby the vertical adjustment of the gage as a

whole is accomplished. The gage is surroundeed by a series of bevel-ended plungers *f*, one of these plungers being provided for each face of the plug gage through a threaded bush *h*, while a coiled spring *i* forces the plug toward the gage *a*. It will be seen that with the gage *a* inserted in the fixture the springs will

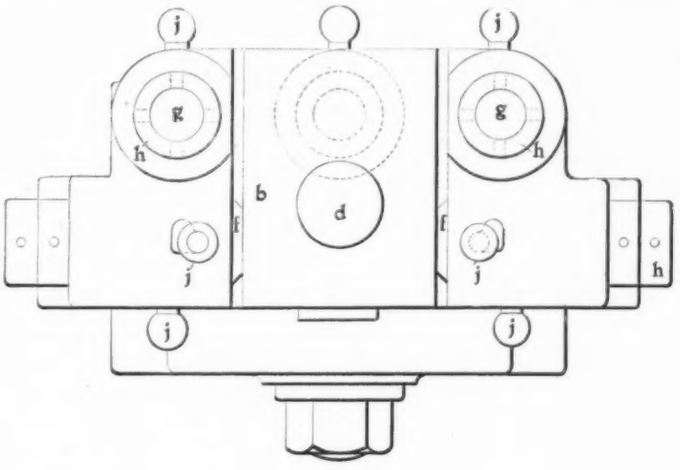

Fig 3

ends of the tails and bushes are carefully hardened and ground, and of course by applying the end of the finger to them the adjustment can be determined with a good deal of accuracy. A thousandth of an inch can easily be split into several pieces by this method.

With this adjustment made, the plug gage *a* is removed and the tool is inserted in the planer. When brought opposite the different plungers, the tools are adjusted until they press the plungers back to such a point that the tails *g* and bushes *h* are again truly flush, when the tool obviously occupies the same position as the corresponding face of the original plug gage, and is correctly set for the finishing cut of the corresponding face of the slot to be made.

Connected with each plunger will be seen a ball-handled pin *j* projecting through a cam-shaped slot in the main casting, These pins enable the operator to draw the plnngers back out of their

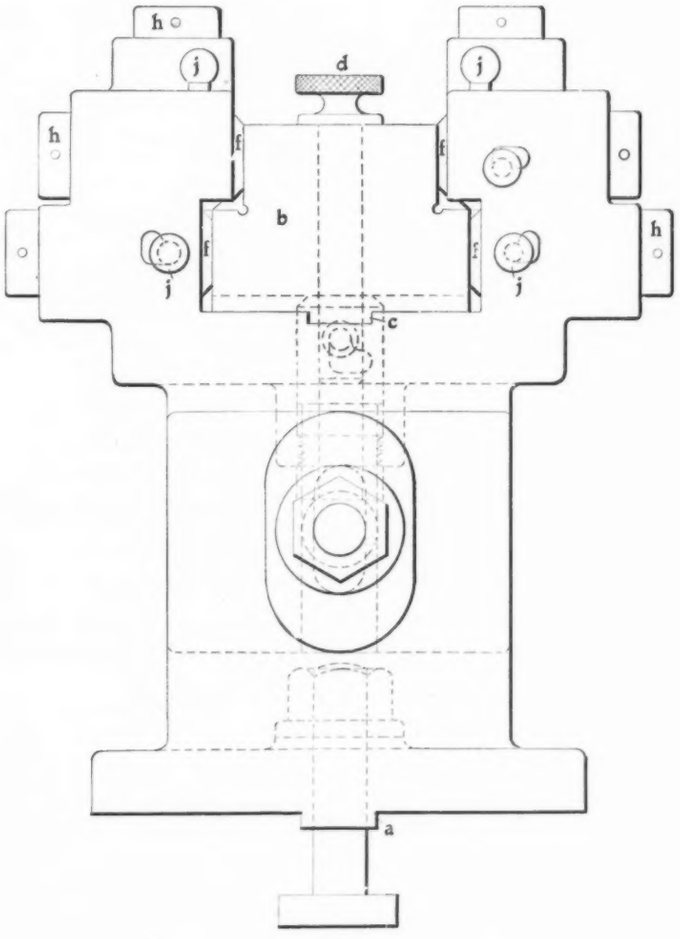

Fig 1

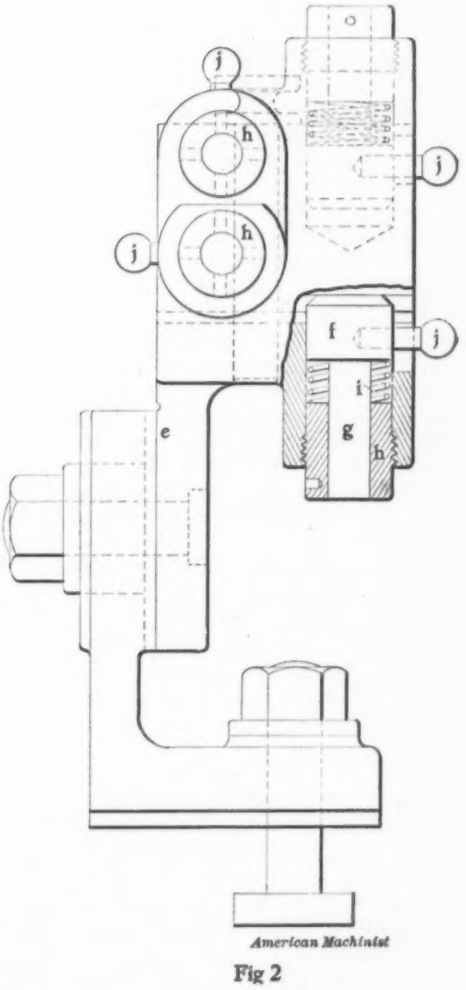

Fig 2

A NEW SYSTEM OF PLANER GAGES.

which is to be reproduced in the boring machine table. The construction of these plungers is shown in Fig. 2, where they will be seen to have a tail *g* sliding force the various plugs to contact with the gage, and in this condition the bushes *h* are carefully adjusted until the tails *g* are exactly flush with them. The positions and lock them there in a manner which is obvious from the engraving, the purpose being to prevent accidental collisions of the planer tools and

plungers and also to facilitate the placing of the plug gage in the fixture.

It will be observed that the fixture described not only sizes the slot, but posisions it as well, and it would seem to be applicable to a considerable variety of duplicate work done on the planer.

▲ ▲ ▲

Spring Winding Attachments.

BY "MACHINIST."

The rapid growth of electrical machinery has added greatly to the scope and usefulness of the machinist's labors. Among other things which he has found himself called upon to do has been to make, or devise means for so doing, large quantities of spiral, or, rather, helical, springs. Electrical work is only one of the many fields in which these springs hold a prominent place. I have had some little experience in making them, and perhaps a description of two of the fixtures I have used and seen used may be of some interest.

The fixture shown in the first cut will make a continuous spring, limited only by the amount of wire in the coil from which it is made. Its range for diameter of wire and of spring I do not know, but I think it equal to the majority of sizes usually made. I have never been called upon to make a spring the fixture would not form, and I have seen it turn out many that I do not know how else they could have been made.

In forming these springs it is always better to bend the wire as it is bent in the coil from which it is drawn. This has been noticed before in the "American Machinist," but, as such things are seen at one time and missed at another, it will do no harm to repeat it here. Fig. 6 shows both the right and wrong way of doing it. It not only requires less power, but prevents trouble from frequent breaks, especially with very stiff spring wire like music wire, otherwise almost sure to occur.

Figs. 1 and 2 show two views of the fixture for forming continuous springs. It is designed to be fastened upon the cross-slide of the carriage of a P. & W. lathe in place of the tool block, and of course can easily be adopted to almost any other make of lathe, or can be used upon a universal plain or hand miller. The frame consists of flat cast iron plates, planed all over and fitted together, and held by screws as shown. The sides are held and stiffened by two bolts passing through them and through two shells which are of such a length as to just fill the space between the sides, keeping them rigid and square.

The roll shafts *e*, Figs. 1 and 2, and the gears upon them are in one piece each, of machine steel. The rolls *g*, Fig. 1, are held upon them by key and spanner nut. The shafts are splined at each end and project far enough beyond the sides that they may be held in a chuck, on centers with a dog, or in any usual manner, and either shaft or either end of shaft may be the driver, as is most convenient. They run in bronze bearings, the upper one in half boxes, with adjusting screws over each bearing, the points of which touch upon hard steel disks let into the top of the bearings. The lower shaft runs in bearings which are bronze bushings forced into the sides. The fixture is shown as driven from the upper shaft, but if possible it is better to use the lower one, and thus avoid adjusting the cross-slide to conform to any change in the adjustment of the top roll shaft found necessary to bring greater pressure upon the wire between the rolls. The gears *f*, Figs. 1 and 2, are 16 pitch, 32 teeth, and, as before noted, in one piece with the shaft. The diameter of the rolls must conform to that of the gears, that is, to nearly the pitch diameter. The rolls should not touch each other when the wire is between them, and the gears must run far enough apart to allow the rolls to be set upon the wire without causing them to bind in the teeth. The rolls are of tool steel, hardened and ground. The groove for the wire when quite small need not be cut in the rolls before hardening, but may be ground out with a thin emery wheel formed up to the proper round on its edge.

The mandrel *h*, Fig. 1, around which the wire is forced by the rolls, lies in a case *i*, held by spanner nuts in slotted openings in the sides. It is threaded as shown, and in this instance for very open springs. It is of tool steel, and if to be used much should be hardened and ground. The thread upon it is cut by a tool about the same round on its end as the wire, and must be wide enough and deep enough to allow the wire to lie in it easily and freely. If the mandrel is hardened, the wire groove or thread may be cut somewhat deeper than the diameter of the wire, that it may be deep enough after grinding to allow the wire to pass through it when the mandrel lies in the case. The mandrel *h* is surrounded for part of its length, where the thread is cut, by a tool steel shell *j* forced into the case *i*, with a nut upon its outer end for convenience in removing, as the shell *j* and mandrel *h* must be changed for different sizes of springs and diameter of wire; as also must the tube *k*, by which the wire is guided from the rolls *g* to mandrel *h*.

The springs, however wound, open some on leaving a mandrel, and a good way to determine the size of *h* for a certain spring is to wind a short piece by hand in a lathe upon mandrels of different sizes until a spring is made of the right diameter, when by calipering the outside of the spring as it lies upon the mandrel, before it is released and allowed to open, the proper diameter of mandrel *h* may be obtained.

The case *i* is adjustable vertically, as shown, that the center of the wire as it lies in the tube *k* in the case *i* may be at the same hight as the center of the wire as it lies between the rolls *g*, and the center of the hole in tube *k* must also correspond with the center of the thread on mandrel *h*. When the wire comes from the reel at the front of the lathe, as shown in Figs. 1 and 2, it must strike the mandrel *h* at its lower side, and when it comes from the back of the lathe it must strike the mandrel on its upper side, with a right-hand thread upon the mandrel, and for this reason also *i* must have a vertical adjustment.

From whichever side the wire comes the rolls in forcing it around the mandrel *h* create some end pressure on *h*, which is attended to by the head on *h* and the cap screwed upon case *i*. This cap was an afterthought, the mandrel being held by three small screws going through its head and into the case *i*. The cap is better, and as there was not room enough to allow of the vertical movement of *i* it had to be cut off on one side or spot. The centers of the case *i* could just as well be one-half inch farther from those of the roll shafts as not, and the frame lengthened that much, to clear the shell back of case *i* through which the side bolt runs. A small screw at *l* goes through the head of mandrel *h* and prevents it from moving after it is adjusted by turning, so the point of the wire, upon leaving the tube *k*, finds the center of the thread on mandrel *h* directly in front of it.

The mandrel *h* can be properly set by slacking the top roll, so the wire can be pushed by hand into tube *k* and against mandrel *h*, which can then be turned with a wrench in the left hand, while pressure is kept upon the wire with the right, until the point of the wire is felt to jump forward slightly as it falls into the thread on mandrel *h*. At this point, where the wire enters the thread on the mandrel from tube *k*, the thread for a short distance may be widened some, and the tube *k* on the right hand side at the place where the wire leaves it worked out some with a pointed scraper, making the bend of the wire easier as it goes around mandrel *h*.

The tube *k* must be so shaped at its end next the rolls that it will lie as close to them as possible to prevent the wire from buckling, as it would do if any great length was left unsupported. The hole through the tube may be one or two thousandths larger than the wire, that it may move through it freely. The tube should be hardened. It is clamped in position on mandrel *h* by the V-block and two screws into the case *i*. Another form of tube is shown at Fig. 7 as more suitable for heavy wire. The one shown in Figs. 1 and 2 is a simple round piece of tool steel with a hole through to mandrel *h*, and is cut more than half way through to conform to the mandrel; this of course

weakens it, and while it is all right for light wire, the one shown in Fig. 7 is strong enough for any wire.

The thread on mandrel *h* is shown in its entire length, but for smaller springs or smaller wire, or for closed springs, very much less thread will be needed, and the remaining length of *h* may be either cut off or turned down to diameter of hole through spring. The mandrel *h* may be cut off to a little beyond the place where which is very small, this is the better way. I have seen springs formed in this manner of wire 1-16 of an inch in diameter, the hole through which would be no larger. It would of course be impossible to cut a mandrel for such a spring to be formed on. Where the spring is large enough to use a mandrel, it saves the making of a tap for the nut. The pitch of the spring can be measured the same as a screw—counting the number of turns for the magazines for repeating rifles used for keeping the cartridges at the end of the magazine ready for delivery to the carrier to be placed in the barrel ready for firing. In connection with the nut when used to form springs, I think it is better to have a wire or rod filling the hole through the nut, and thus leaving the only passage open to the wire in the thread.

It is most convenient to run the spring

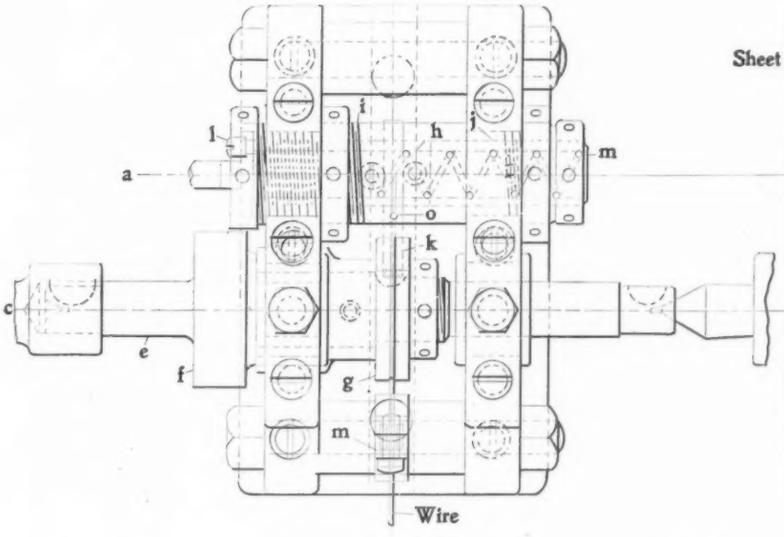

Fig. 1

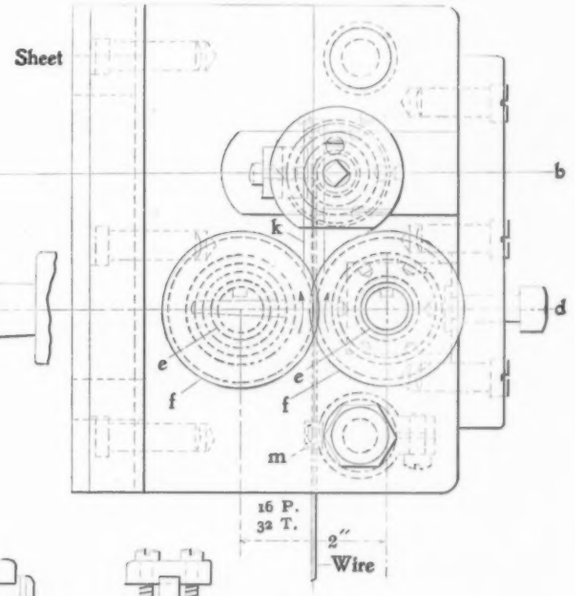

Fig. 2

Fig. 7

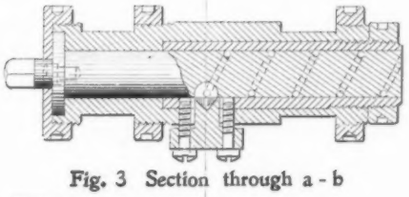

Fig. 3 Section through a - b

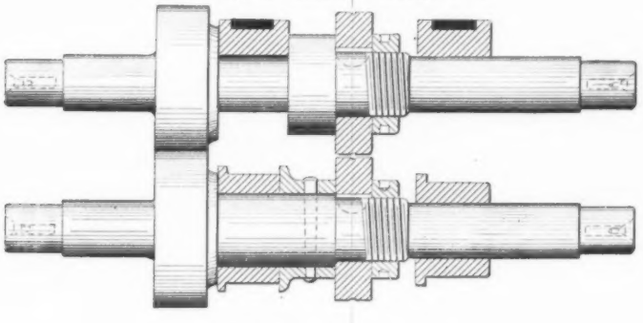

Fig. 4 Section through c - d

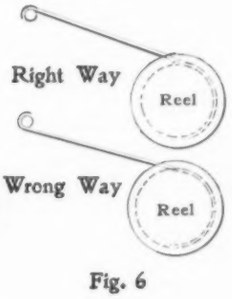

Fig. 6

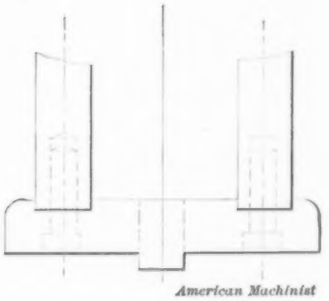

Fig. 5

A LATHE FIXTURE FOR SPRING WINDING.

the wire first enters the thread and tapped out on its end, so that different sizes of mandrels, with varying pitches and shapes of threads upon them, may be screwed into it, making of the head end of *h* a sort of holder for several mandrels, and somewhat lessening the expense of changing from one size of spring to another.

A nut may be put in place of the mandrel and the wire forced into this. It works equally as well, and for small springs of stiff wire, the hole through to the inch and cutting the same as any screw for either open or closed springs with a round nose tool of proper form. For closed springs the threads of course lie close together, the separating fillet is not very high, but will be sufficient, as the shell *l* holds the wire down in the thread, and when the end is once out of the case *i* there is no trouble.

I have seen quantities of springs wound with a fixture of this kind, and on one job which I remember particularly; they were toward the tailstock. If the fixture is arranged to draw the wire from a reel at the front of the lathe, and it is desired to bring it from the back, when the fixture is changed for this position the open end of case *i* will point toward the headstock. It must be turned by slacking the spanner nuts clamping it to the sides and removing the caps covering the slots in the sides in which it lies, so that it will point toward the tailstock. This will also bring tube *k* upon the top, where it must

be in taking the wire from the back of lathe with a right hand thread on the mandrel *h*.

With the fixture in this position, and the bottom roll shaft as the driver, the lathe must run forward as in turning; with the top shaft as driver, it must run backward. With the fixture reversed and taking wire from the front of the lathe, as shown in Figs. 1 and 2, with top shaft driving, the lathe runs forward as in turning, and with bottom shaft driving—backward. In operating the fixture the wire, upon first entering it, passes through an eye in an adjustable clamp on shell at *m*, Figs. 1 and 2, next between rolls *g*, Fig. 1, then through tube *k* and case *i*, to mandrel *h*, around which it passes, and out of case *i* and shell *j* at *n* in the form of a spring.

There is an oil hole shown in tube *k* at *o*, Fig. 1. Oil should be dropped through it upon the wire as it goes upon the mandrel. The hole goes through tube *k* that it may be used in either position of the case *i*. When tube *k* is at the top the other half of the hole not in use can be plugged with a bit of leather, putty or wax.

I have made a large number of springs from music wire, and was at one time, in the summer, considerably troubled by the rusting of the springs after they were made. The wire comes from the manufacturers in small coils filled with air-slacked lime, and so, adopting this hint, I kept the springs in lime until ready for use, and avoided trouble from this source. Air-slacked lime is a great absorbent of moisture, and metal work or tools so liable to rust in the damp atmosphere of the warm months can be kept from doing so by its use.

Figs. 3 and 4 are sections of case *i* and the roll shafts, with the rolls and bearings. Fig. 5 shows the manner of fastening the sides to the base.

The fixture shown in the second cut is to be held in the hand or rested against a part of the lathe as it lies on the mandrel. It will wind open or closed springs limited in length by the length of the mandrel. The nut shown in the holder held by set-screw is tapped or bored out, as most convenient, and hardened. The wire enters at the point marked, and in the holder a steel bushing is shown encircling the hole through which it passes. The hole through the nut goes directly into a thread, and is slotted as shown to make the bend of the wire around the mandrel easier. After entering the thread in the nut, the end of the wire is pushed through a hole in the mandrel. For closed springs only a shell or bushing is needed, but it must be counterbored on the back end toward the headstock for about two-thirds of its length, the remaining third fitting the mandrel. The counterbored portion is about .002 or .003 inch larger than twice the diameter of the wire plus the diameter of mandrel, allowing the spring to lie in it easily after it is made, and as successive coils force the fixture along the mandrel. The usual way of making springs on a mandrel is to wind them from a clamp. The advantage of the fixture in this form of spring is that it keeps the spring winding evenly and prevents one coil from riding upon another, as they will sometimes do.

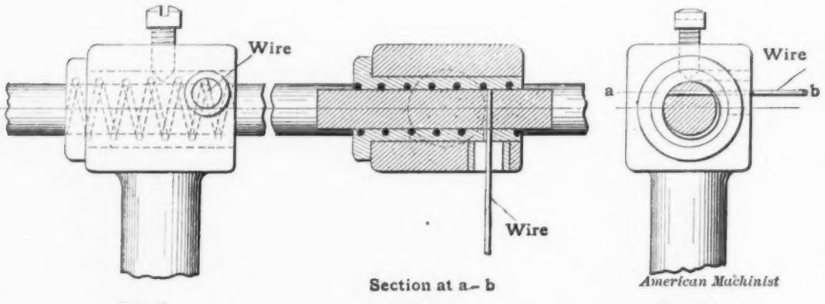

Fig. 8 Fig. 9 Fig. 10

HAND RIG FOR SPRING WINDING.

Figs. 1 and 2 show the fixture on the mandrel in position to wind. Fig. 2 shows a section through *a b*, and Fig. 3 is an end view, showing the wire passing through the mandrel.

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The Union Iron Works Boring Mill.

Through the courtesy of the Union Iron Works, of San Francisco, we are enabled to present an illustration of their large boring mill, which was referred to in terms of commendation by Professor Sweet in one of his letters.

This mill is believed to be the largest in existence, and, as will be seen from the illustration, it possesses many novel and interesting features, Other mills are in use which, with the housings run back, will swing as large a piece as this one, but this swings its largest piece (30 feet diameter) without the use of such expedients, and has a table of 24 feet diameter, appropriate to this full swing.

It will be seen that there is no elevating cross rail, but a stationary overhead beam, with a clear distance of 10 feet between it and the table. The right-hand upright has a slide rest and tool box, which, however, are only used on work between 25 and 30 feet diameter. For smaller diameters, and for facing, there is a compound slide carried on a heavy swinging arm which is swung from a post behind the beam, the upper end of the post being secured to the beam, while the lower end is bolted to the bed of the machine.

A seat with studs will be seen on the upper side of the arm near its front end for attaching a post, which is also bolted to a quadrant face on the rear side of the beam, with bolt slots to permit the movement of the arm up and down and to swing, the purpose of this post being to secure rigidity to the tool. A quadrant bracket with rack and pinion and locking slot is fitted to the right side of the swinging arm that brings it into position for work and locks it there. The tool slide is mounted on a swivel face on the end of the swinging arm, so that the rest can be swung into any position either for turning or facing. In the photograph the position is for horizontal facing.

The overhead beam carries a saddle and bearing for a boring bar, with gear for operating the bar independent of the motion of the table. Another feature of this unique tool will be seen in the operator's platform, suspended from the beam and provided with horizontal and vertical power movements.

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Letters from Practical Men.

Store Taps.

Editor American Machinist:

The most unsatisfactory tools in the machine shop are the hand taps machinists are compelled to use. These are made in factories of cheap steel and are well made, polished nicely and sometimes even tempered correctly.

They look like good tools and will deceive the oldest buyer of tools. They are not good, however. Being made like a nut tap with a very small square for the wrench, they soon give out at both ends. The steel is usually cheap and soft, and the square twists off, when another is ground on with the same result, until finally the head is "all chawed up." The steel being cheap they do not keep their size and relief, if indeed they ever had any. They work tight in the hole, and whatever thread they do make is squeezed, not cut, and, if in cast iron, liable to be about as good as no thread at all. The writer hereof was once shown some taps by Mr. Geo. R. Babbitt in the Harris-Corliss Engine Works, at Providence, made by a nearby factory that make such tools, that were a decided advance from the ordinary store tap. They were made with shanks the

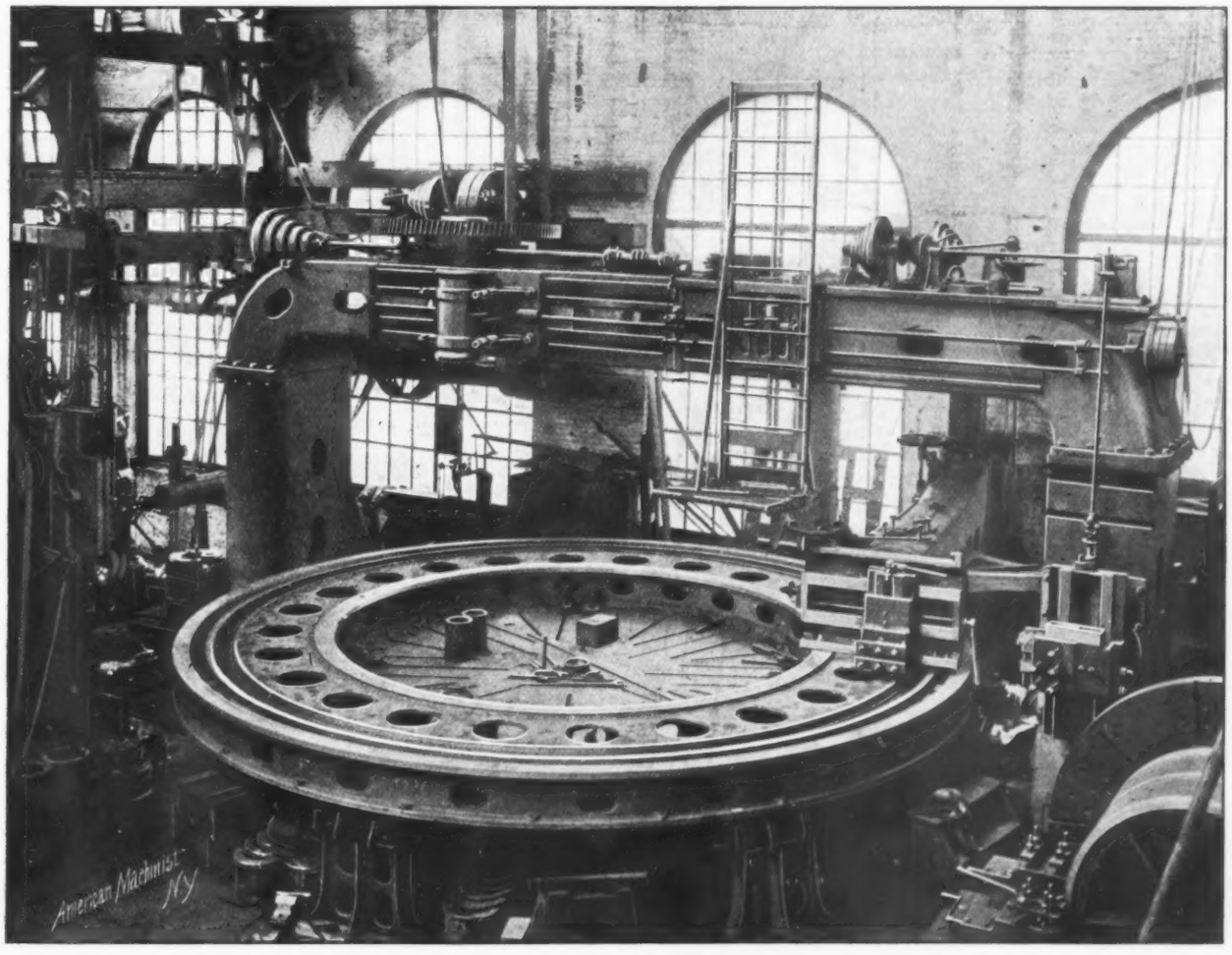
full size of the thread and with a square the size of the bottom of the thread with a shoulder, a small space being turned down at the end of the thread for clearance.

A further convenience used by Mr. Babbitt with these taps was a collar with a flange to rest on the shank of the tap and on the work, so that the workman could see when the tap was square without using a try square. These taps were excellent, as I could see, and as I was informed, and as the plan of using them was the best I had seen, I determined to adopt it. Upon application at the factory named I was informed they did not make them for the trade and could not supply them.

I have never yet found a factory that can supply them, and I infer that Mr. Babbitt had his made to order. When I could not buy them anywhere I determined to make them. Procuring the best steel to be had at any price, I had a full set of all the ordinary sizes made as above, and, without boasting, I can say they are the best all-round set of taps I have ever seen. They cost more than store taps, certainly, but they do not wear out or lose their relief or work tight in the hole, and apparently they are as good as they were seven years ago.

It is simply the result of good steel, good workmanship and proper tempering. It will pay any shop to do likewise, or, what is better, it would pay any manufacturer to make such taps and sell them at a necessarily advanced price, for most shop people do not care to make their own taps. The reasons given by manufacturers and salesmen for not making a better class of taps are that they are not called for by the trade. Of course not; it is no use to call for a thing that cannot be had, and the buyers of tools are generally not the users, and hence anything that looks well will go, and the poor machinist has to submit to "legislation without representation."

C. W. CRAWFORD.



THE UNION IRON WORKS 30-FOOT BORING MILL.

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Turning Wooden Balls.

Editor American Machinist:

The recent article on "Ball Turning," by Mr. Newton, attracted my attention. The way proposed by him is all right for the mathematical pattern-maker who is conversant with decimals, but there are a great many first-class craftsmen who are totally at sea when asked to use decimals in connection with their work. The results obtained in the manner described by Mr. Newton are certainly good, but I have a much simpler and more practical way of turning a ball, which an ordinary apprentice boy can use, and in a quarter of the time can produce a more perfect ball. While engaged with one of the leading bicycle manufacturers I was requested to make a model of wood of their crank hanger and sprocket wheel complete, eight times their original size, for advertising purposes. The sprocket wheel was 6 feet 6 inches outside diameter, crank 52 inches center to center, outside diameter of crank hanger 14½ inches. There were thirteen balls each side of the crank 2½ inches diameter, all made of wood. The cones for the balls were of wood and provided for adjustment. In fact, an exact duplicate was made of the standard crank and hanger, only larger. The crank hanger had a piece of plate glass in both ends 1 inch

thick, to allow the balls to be seen in operation.

The accompanying sketch explains the making of the twenty-six balls for each crank. Take suitable size lumber for

Fig. 1

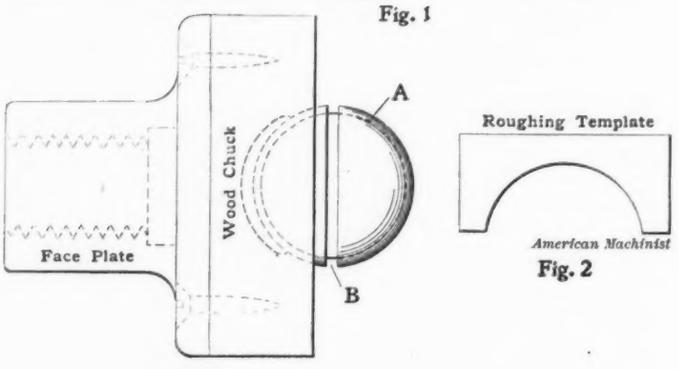

Fig. 3

Fig. 2

TURNING WOODEN BALLS.

turning about three balls per stick, Fig. 1, on the lathe centers, and rough out the balls to within about 1-16 inch of size, using an ordinary wood template, Fig. 2. Then cut off each ball and turn a wood chuck, as per sketch, Fig. 3. After chucking the ball, with the face of the chuck within about ⅛ inch of the center of the ball, turn a ring about ⅛ inch wide (in center) to the proper finished diameter. Then remove the ball from the chuck, turn it a quarter of a turn in chuck and turn another ring as at *B*; this also the proper finished diameter. All that is necessary to do then is to simply turn off the surplus wood (between the quarters of the ball) down to the ring *A*. After turning half of the ball remove it from chuck and then replace it again with the other half to be turned outward, and proceed to turn this down to the ring *A*. This will give a perfect ball, if the pattern-maker is careful enough in turning to the rings.

The sketch is self-explanatory, and, although it may not be an entirely new way of turning balls, it is certainly cheap and effective. After I had finished the twenty-six balls required for one complete wheel they ran with less friction than similar sized balls of steel.

FRANK J. BOV.

La Porte, Ind.

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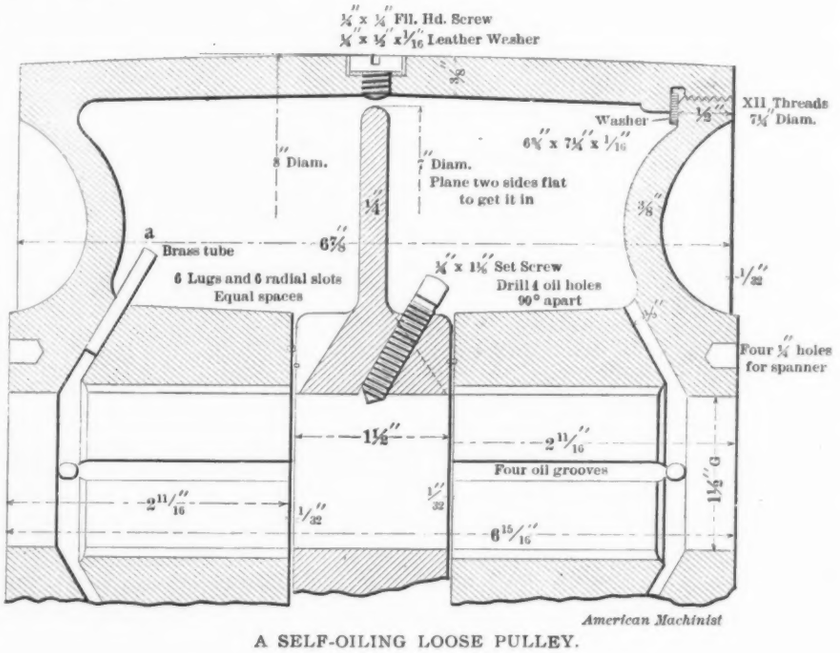
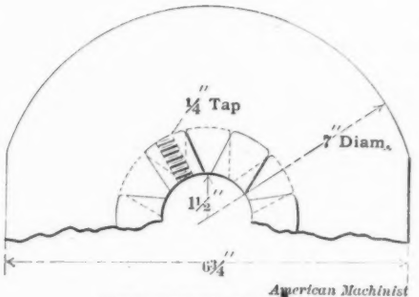
A Self-Oiling Loose Pulley.

Editor American Machinist:

The accompanying drawing may be of sufficient general interest to show in connection with the article on loose pulleys in the "American Machinist" a short time since. It is a shop drawing, showing sectional view of the hub, and one side of pulley; also, to a smaller scale, one side of half of central disk. The object which we attain in this invention is a constant and continuous lubrication of the bearing so long as any oil remains in the interior of the pulley. The construction as shown by the drawing is self-explanatory.



A SELF-OILING LOOSE PULLEY.



THE CENTRAL HUB.

The action is as follows: The pulley, when in position on the shaft, the central disk being secured by the set screw, is filled about one-third full of oil. When in motion the centrifugal force holds the oil as far from the center as possible. The inside of the shell being of greater diameter at the center than at either end, so long as there is any oil in the pulley it will be carried to this point, thereby flooding the periphery of the central disk. As this disk is at rest when the pulley is running, the oil on the upper part of the disk flows by gravity down to the hub. As the ends of the hub of the disk are cut into six or more radial slots they allow the oil to pass to the grooves in the bore of the pulley hub, thence through them to the circular grooves near the outer ends and through the opening to the central chamber. The brass tubes, one shown at *a*, in these openings are for the purpose of extending them far enough into the chamber to prevent the oil from running back to the circular groove on stopping the machine, which otherwise would case a small leak.

C. H. SHAFFER.

Muskegon Hights, Mich.

A Continuous Screw-Slotting Rig —Depth Gage—Scratch Gage.

Editor American Machinist:

I inclose sketches of a screw-slotting devise, a scratch gage and another depth gage, similar to the one illustrated in your issue of June 30.

Fig. 1 shows a screw slotting rig for use on a vertical milling machine having a rotary feed table. It consists of a ring, clamped to the table, with holes drilled radially around its entire circumference to receive the blanks to be slotted. After the ring is filled and the first few blanks are finished, begin taking them out and

inserting new ones, thus keeping the machine at work continuously. I use this rig on large screws from ⅜ inch upward; the chuck shown is for ⅝-inch filister head screw, slot ⅛ inch wide by 3-16 inch deep, head 1 inch diameter. We make many thousands of this size screw, and I find they can be slotted much faster in this way than by using a lever and grip, as is ordinarily done.

The depth gage shown, Fig. 2, is one I made some seven years ago for die sinking purposes. The head has a hole drilled almost entirely through lengthwise to receive the small rod containing the half nuts, as shown, with a spring at the back end. I put two holes through the head to locate the spindle in different positions; the spindle is threaded its entire length. The only objection I find to this gage is the tapered point on the spindle, from which it is hard to take scale measurements. The thumb nut at the left binds the spindle in position.

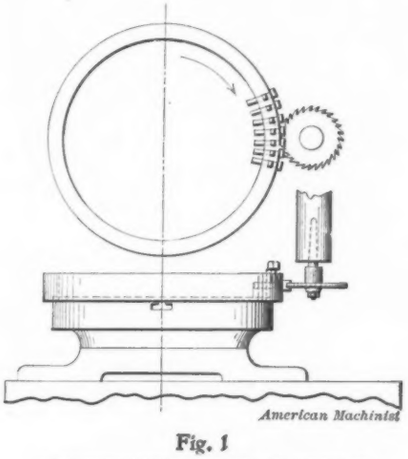


Fig. 1
CONTINUOUS SCREW SLOTTING.

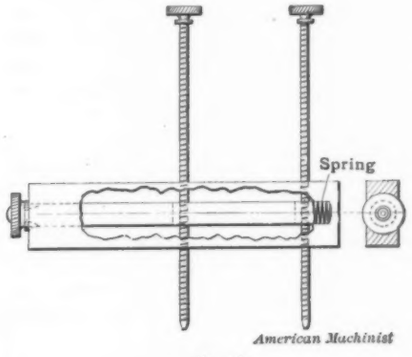


Fig. 2
ADJUSTABLE DEPTH GAGE.

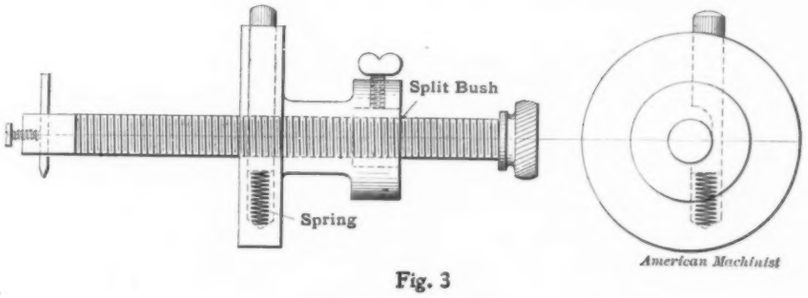


Fig. 3
A SCRATCH GAGE.

The scratch gage, Fig. 3, is made on nearly the same principle as the depth gage. The spindle is threaded its entire length, 16 to the inch, and instead of passing through the half nut, passes by the side, as shown, the nut being cut away to allow the spindle to slide freely when released, which is done by pressing the projecting end of the half nut. The spindle is held in position by the thumb screw and a brass split bushing, as shown.

W. A. G.

Chord Pitch or Arc Pitch?

Editor American Machinist:

Mr. Randol's interesting account of how the R. Hoe Company in New York originated a certainly remarkable index wheel, but especially the description of originating the rack, in your issue of the 18th inst. calls to my mind a practice of the Hoe Company that I can hardly account for, after having learned about the pains taken in producing a rack with true pitch.

In the years 1893-95, being employed as draftsman by the Hoe Company, I had often to figure out gears, as such are used in great numbers about their machines. For this work an old table out of print was furnished and used, and on examining it I found that the pitch circles were calculated for chord pitches, not arc pitches. The tables contained the sizes for gears of all ordinary pitches and numbers of teeth. I spoke about this faulty practice (for so I regard it), but was advised, however, to go by the table.

Taking for an example a 12-tooth pinion, 1½ chord pitch. This pinion has an arc pitch, or true pitch, of 1.517 inches, or seventeen-thousandths of an inch more than the rack it works with.

JOHN BERGSTROM.

Hartford, Conn.

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The Fuel Value of Corn.

Editor American Machinist:

Referring to the recent discussion of the value of corn as a source of power, it may be of interest to cite some experiments made by the writer last year to determine the fuel value of corn. The experiments were undertaken because of the widespread use of corn as fuel in Nebraska and some of the other great corn-producing States of the West, and because it seemed desirable to determine at what price per bushel the corn ceased to become an economical fuel. The complete results of these tests were presented in a paper read before the Mechanic Arts Section of the Association of American Agricultural Colleges and Experiment Stations (see the Proceedings of the Association for 1897, being Bulletin 49 of the United States Department of Agriculture; also Cassier's Magazine for October, 1897).

Proximate analyses were made as follows:

Kind of Material.	Moisture.	Volatile Matter.
Yellow Dent Corn—		
Corn	8.45	78.10
Cob	8.00	75.97
White Dent Corn—		
Corn	8.88	77.22
Cob	7.88	77.65
Yellow Dent Corn—	**Fixed Carbon.**	**Ash.**
Corn	12.18	1.27
Cob	14 68	1.85
White Dent Corn—		
Corn	12.90	1.00
Cob	13.73	1.24

It was found that the corn possessed the following calorific value in B. T. U. per pound of air-dry material, as above:

Yellow Dent Corn—	
Corn and cob	8,040
Corn	8,202
Cob	7,214
White Dent Corn—	
Corn and cob	7,841
Corn	8,382
Cob	7,571

Since so large a part of the corn is volatile matter that can be driven off at a comparatively low temperature, the writer is inclined to be of the opinion that fewer mechanical difficulties would be encountered by the direct utilization of this volatile constituent in an ordinary gas engine.

From the above calorific value of corn it is somewhat interesting to calculate the fuel value of an acre of land.

C. R. RICHARDS.

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"The Engineer," London, in its persistent discussion of the conditions of industrial success—American success—is continually making most surprising discoveries. The following is news indeed:

"Another point is that in the United States there are four classes of workers—the Americans proper, the Germans, the Irish and what are lumped together as the 'niggers.' These four classes never coalesce. If the Americans do not work properly out they go and the Germans come in. If the Germans give trouble out they go and the Irish come in, and if the Irish do not work as they are wanted out they go also and their places are taken by the 'niggers.' In this way there may be said to be competition of the most practical and useful kind between the different classes of workmen and the different unions in the various workshops."

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The Industrial Outlook.

Six months or less of the present year have been perhaps the most prolific of momentous events in our whole history, and the events in succession have wrought an astonishing transformation of our national attitude and outlook. The unexpected has happened to us with rapid repetition. We have received added assurance of the flawless solidity of our internal structure, and we have taken the measure of our high stature among the nations of the earth. Without a thought of boasting, the promise of national growth and greatness was never before comparable with that of to-day. Everything is going our way, and there is no seriously disturbing influence in sight. In wheat and cotton, in coal and oil and iron, we make the price for the markets of the world, and we are the most increasingly prolific producers of the staples of life.

But above all the producers of the crude materials upon which the life of the civilized man depends are those who shape the materials for his specific uses. The manufacturing nation is *the* nation, and this we are with increasing pre-eminence. While the products of our mines and of our fields are greater for each succeeding year, the output of our shops and of our factories grows with more wonderful rapidity. What is of the greatest importance in maintaining the balance of our industrial life, our consumption also, our absorption by use and enjoyment of the goods produced, grows also with the rest, and especially is this growth active at present. Wheat is high, and in the prosperity of the farmer we have increased demand for all our best products at home. Our own borders also are extending, the market is commensurately increasing, and a broader range is given to the variety of products to be exchanged, and of goods to be distributed. The foreign markets are rapidly opening to us. We are cheapening and improving our goods and learning the ways of outside trade, so that soon the people will be hard to find to whom we cannot sell at their own price.

We are going to be busy for years. We are going to be too busy to be soon or easily involved in frivolous or disheartening political experiments. We are in a position where we can ask little of Government, and where Government can do little to help us except to look on at our orderly activity, and maintain friendly relations with all peoples.

This all means, if it means anything, that machinery and machinists, that all who have to do with the production or operation of machinery are to be active as never before. Nothing now goes except as it is driven by steam or water or one of the still minor motors, and nothing is done, however intricate, but the finger of machinery is employed. The increasing employment of machinery and its widening application are a constant wonder. The constant supersession of machinery by improvements upon itself, so that it may almost be said that no modern machine has ever a chance to wear out, is also to be noted. If any man should be sure of a job for years to come, and should experience the highest expression of appreciation in having constant employment, it should be the machinist. Shops come up and shops go down, but the shop where machines are built cannot perish from the earth. It is now likely to be more active and healthy than ever in its life before.

The Method of Machine Improvement.

"The Engineer," London, in a recent issue gave illustrations of two electrically driven cold saw cutting-off machines built by the Newton Machine Tool Works, Philadelphia. An essential feature of one of the machines, which was shown in our columns last year, was a turntable under the whole machine, enabling it to be turned at right angles or to any angle desired, thus not only accomplishing a considerable saving of shop space, but allowing it to assume the most convenient position in relation to the special work at any time to be handled. In remarking upon this construction, the "Engineer" proceeds as follows:

"This is a point worthy of particular attention, as it is a feature very noticeable in recent American tools, and one to which we have on previous occasions called attention. English manufacturers, with a few notable exceptions, are rather apt to disregard such conveniences as these. The handiness of machine tools also receives frequently too little consideration from British makers. Not long ago we visited a works where some large drilling machines made by a very well-known firm were in use, the various handles and levers of which were particularly well arranged, but when we remarked on them we were informed that it was only after insisting on that arrangement, and absolutely refusing to accept the machines till they were put right, that the desirable point was gained by the purchasers. We have very little doubt that the makers have not profited by the hint, but still continue to make the machine in the old style, although the improvement could not fail to be evident to all users. We have no hesitation in saying that such a case could never occur in America, the fact being appreciated that the rate of output of a machine depends largely on the convenience with which it can be used."

This is only the perception and statement of what is constantly familiar with us. Nothing of our ways and means is fixed. We recognize not only the possibility but the certainty that all our machines and methods are capable of improvement, and that they must be constantly so improved to enable us to aggressively hold our own.

The condition to be insisted on is perhaps not all or chiefly that which the "Engineer" suggests. It is not so much a conversion of the tool builder to the acceptance of hints of improvement from without that is needed, although he should always be ready to appreciate and adopt such suggestions. He needs a vastly greater change than this. The builder should be himself aggressive in improvement by virtue of his position. He should be a student of his product, should know more

about it than any man can tell him, should know its faults and deficiencies as well as its excellencies and capabilities. It is not so much his business to recognize and fill existing wants, whether "long felt" or not, as to create new ones. All the trades, those with which we have to do as much as any, are being improved and advanced more by the pressure from without than by their own activities. It is not the molder that invents the molding machine or the improved hoisting and transportation facilities of the foundry, and so it is not so much in the everyday machine shop that the tools of the shop are improved and the new tools developed as in the shops of those who set out to produce the best tools that can be made, and to compel their initial acceptance and their final general adoption. That such as these should only under compulsion adopt self-evident improvements for their machines is not to be seriously considered, for it should be so nearly an impossibility.

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Piecework and Peace.

The recent strikes against piecework at the works of R. Hoe & Co. and the Bullock Electric Manufacturing Company call attention again to the piecework system as a mischief maker and a discord breeder. We believe it to be almost impossible to find a shop in which this system has been long employed in which there is not a state of ill-concealed antagonism between the workmen and the management, growing out of the repeated cuts which the management is compelled to make in order to reduce costs, but which the men rightly understand as setting a limit to their earnings and as a punishment for extra effort.

In the past there was an ample excuse for the manager who adopted the system—the excuse of necessity; but at the present day that excuse no longer holds. The Premium Plan has now been before the public for several years and has been given sufficient trial to demonstrate that it not only avoids the ill-feeling which piecework foments, but that it does silently what piecework does only through constant turmoil—introduce a progressive reduction of cost, and, moreover, while with piecework such reduction is only accomplished through the antagonism of the men, under the Premium Plan it is the direct result of their efforts to benefit themselves.

As originally published, the plan was looked upon, and perhaps justly, as a mere scheme, without experience to prove the soundness of the claims made for it, but that view is no longer tenable. Practical use by hard-headed disinterested men has shown the system to do what it is claimed to do, and the superintendent who is not aware that the way is now open to all that he has tried to accomplish through piecework, and to relief from all its troubles, is not posted as he should be.

Personal.

Mr. Wm. A. Fannon, superintendent of the Valley Iron Works Manufacturing Company, Appleton, Wis., was recently appointed receiver of the company mentioned.

Mr. W. S. Accles, manager of the English branch of the Niles Tool Works Company, who has been here on a brief business visit, sailed for Europe on the 20th ult. per Campania.

Chas. L. Noll, purchasing agent of the Sprague Electric Company, has removed from the company's New York office to the factory at Watsessing, N. J.

Mr. Hugh R. McGregor, of Providence, R. I., who has recently been in Scotland in the interests of the Brown & Sharpe Manufacturing Company, returned to this country August 20 on the steamship Umbria.

In recognition of the brilliant achievements of Chief Engineer Milligan with the engines of the Oregon he has been assigned to the flagship New York, which means for him an increase of salary of $1,200 per year.

Mr. Riker, of the Riker Electric Motor Company, has returned from a six weeks' European trip in the interest of his motor carriages. We understand that his trip was highly successful, both in direct sales and in offers of foreign capital.

Capt. Barhotkyn, representing the St. Petersburg Society of Metallic Works, St. Petersburg, Russia, desires catalogs of all classes of engines and machine tools. He may be addressed care of the Carnegie Steel Co., Munhall, Pa.

Andrew J. Harrison, Eugenius A. Jack, William Robinson, Nathaniel E. Cutchin, Charles F. Nash, Edward J. Noonan, Harry L. Boyd and Herbert W. Spear have been appointed to be chief engineers in the revenue cutter service.

Prof. A. W. Smith, who has charge of the Department of Mechanical Engineering at the Leland Stanford, Jr., University, California, has just entered upon his sabbatical vacation year, and in connection with it has inaugurated a new departure. Instead of, as is customary, spending his vacation in Europe, he has obtained a position with the Dickson Manufacturing Company, of Scranton, Pa., where he will put in the year in commercial work. His special object is to make a study of mining machinery, to meet the demand for instruction in that subject in California.

President Charles Davis, of the American Tool Works Company, Cincinnati, Ohio, is seriously ill at his home. Mr. Davis recently returned from a trip abroad taken for the benefit of his health, and at that time was completely recovered. Since then, however, he has been forced to relinquish part of his work. As soon as he has recovered sufficiently he is expected to take another trip abroad for his health.

Mr. F. E. Drake, of the Walker Company, has been selected as electrical adviser to United States Commissioner-General Ferdinand Peck to the Paris Exposition of 1900. Mr. Drake sailed for France, with the Commissioner-General and party, on the steamer La Touraine, September 3. He expects to return to this country about the middle of October, and will then resume his duties with the Walker Company.

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Obituary.

Frederick Knoss, who died at Phœnixville, Pa., August 24, seventy-five years old, had been employed by the Phœnix Iron Works forty-nine years. During the civil war he was engaged in the manufacture of the Griffin gun, at the above works.

James Long, foreman of the Lehigh Valley Railroad Company's machine and blacksmith shops at Packerton, Pa., died at that place August 30, sixty-eight years old. He had been in charge of the shops since their construction and until his retirement a few months ago.

Henry Mason, superintendent of the Quintard Iron Works, of this city, where were built the engines of the Maine and many other engines for the United States Navy, died at his home in Brooklyn, August 27, sixty-nine years old. Mr. Mason was born in Newcastle-on-Tyne, England, and came to this country with his parents about 1840. He entered the Quintard Works in 1858.

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The Engineers' Club Dinner to the Engineers of the Santiago Fleet.

The Engineers' Club, of New York, honored itself by giving a dinner and reception to the engineer officers of the Santiago fleet at its club-house in this city the evening of September 1. Owing to limitations of room, only about forty could be accommodated at the dinner, but at the reception which followed no such restrictions obtained.

The following engineers of the fleet were present: Passed Assistant Engineer Ball, of the New York; Chief Engineer Bates, of the Texas; Passed Assistant Engineer Bennett, of the New York; Chief Engineer Hannum, of the Brooklyn; Chief Engineer Leahy, of the Oregon; Chief Engineer McAlpine, of the Texas; Chief Engineer Milligan, of the Oregon; Passed Assistant Engineer Patton, of the Brooklyn.

Chief Engineer Bailey, of the Massachusetts; Chief Engineer Cowie, of the Indiana, and Chief Engineer Rae, of the

Iowa, were expected, but were unable to be present.

Owing to the heat of the evening, the usual list of toasts and speeches was dispensed with. The occasion, however, lacked nothing in the way of enthusiasm, a description of the run of the Oregon, by Chief Engineer Milligan, being the event of the evening. An account of this run has already appeared in our columns, but many additional and interesting facts were brought out by Mr. Milligan. The complement of engineers was on a peace footing, their numbers being only about three-fourths of the full war complement, which, of course, added to the severity of the work.

At Rio the news from Manila was obtained, together with definite information of the existence of war, under which circumstances, of course, Captain Clark desired to increase the speed, which, prior to that, had been kept down in order not to overwork the men. Mr. Milligan gave it as his opinion that it would be unwise to do this, as in the heat of the tropics he did not believe the men could endure the additional strain. He soon found himself with an incipient mutiny on his hands, the assistant engineers and firemen declaring that the increased speed could be obtained without overtaxing them, and, in consequence of this, the increased speed was made. Mr. Milligan, in fact, paid the warmest possible tribute to the spirit of devotion and self-sacrifice displayed by the assistant engineers and firemen, declaring that the chief credit for the achievement belonged to them, and saying that he intended to do what he could to have some substantial recognition of this made by the authorities in Washington. He also gave a warm tribute to the workmanship of the engines, saying that in a long sea trip it is always expected that some salt will find its way into the boilers through leaks in the condensers—the presence of this salt showing itself by being deposited on the boiler plates around any slight leak which may show itself. Although in this case such a leak occurred, there was no evidence of any salt. He considered this a remarkable evidence of the excellent workmanship, which, he declared, was the foundation of the successful trip.

At Rio a dispatch informed them of the departure of Admiral Cervera's fleet from the Cape Verde Islands, and plans were at once formed for the course to be followed in case it should be met. This plan was to at once turn and run, relying upon the good speed of the Oregon to call out the best efforts of the Spanish fleet to catch her, thereby inevitably stringing the fleet out into a long procession. This accomplished, the plan was to attack and destroy the Spanish vessels one at a time, and Mr. Milligan stated that in view of later events at Santiago, he fully believed that if things had turned out that way the plan would have succeeded.

At the conclusion of Mr. Milligan's speech President Thompson proposed the following toast, which, it is needless to say, was drunk with enthusiasm:

To you, our honored guests of the evening, who conducted American battleships to most glorious victory, we can only offer in homely phrase our best wishes for health, happiness and prosperity, and to all engineer officers of the United States Navy we express the hope and pledge our best endeavors to its material realization, that the phantom of "relative" rank shall soon be supplanted by that to which your achievements entitle you—the topmost place of positive rank.

The reception followed the dinner, and, as one gray-haired veteran remarked in the writer's ears: "The atmosphere of the evening leads to the feeling that for once we are the people."

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Sixth Annual Meeting of the Society for the Promotion of Engineering Education.

The Society for the Promotion of Engineering Education held the most important meeting in its history during the 18th, 19th and 20th ult. in the Walker Building of the Massachusetts Institute of Technology, Boston, Mass. The society this year affiliated its interests with those of the American Association for the Advancement of Science by prefixing its session to the general programme of the jubilee meeting of the association, which is the foremost general scientific society in the New World. A large and appreciative attendance at the various meetings of the engineering educators was the result. Many foreigners were present, being the guests of the city of Boston. It is safe to say that such an important gathering of engineering educators from all over the world was never before seen anywhere.

The council of the society met on the morning of the 18th, but no business of public importance was transacted. Immediately after adjournment of the council, President John B. Johnson, of St. Louis, called the general meeting to order, and opened the session with a forcible and instructive address on "A Higher Industrial and Commercial Education as an Essential of Our Future Material Prosperity." He said in beginning that the material prosperity of any country is the foundation of the happiness and of the progressive enlightenment of its people. To learn the essential conditions of such a prosperity, therefore, is a matter of supreme importance. "To-day," the speaker continued, "nearly all knowledge is scientific, and should be acquired by scientific methods. Formerly the industries were directed by mechanics, who by a long apprenticeship had slowly acquired the manual methods of their predecessors; to-day they are most successfully guided by men of large scientific attainments, and in the near future such scientific direction will be absolutely essential wherever there is free competition in the market to be supplied. Prosperity, or even supremacy, in material things in the past is therefore no promise of such a position in the future."

The past commercial supremacy of England was described at some length, followed by the story of the sudden rise of German competition, with reasons given for the cause of the prosperity of that country. The speaker told of the new conditions of production and how they had been adopted by Germany. Monotechnic schools for all the leading industries of the empire, he said, are to be found in that country, and he gave an interesting description of their organization and work. The colleges of commerce were treated in the same way and highly commended.

In comparing America with the countries mentioned, President Johnson said that "we have run the race of the prodigal son and are now beginning to come to ourselves and to ask if there are not better methods of administering our heritage to be learned in our father's or, as I am insisting to-day, in our grandfather's house. For the past five years we have suffered greatly and have not known what was the cause of our distress. Our manufacturing industries have been greatly depressed, while those of foreign countries have been experiencing a period of unwonted prosperity. We have sowed the wind and have reaped a whirlwind. We have ignored and scouted all the laws of material prosperity, saying they did not apply to this country, and after five years of punishment for our sins of ignorance we are shutting our eyes to the plain teachings of our sorry experience."

In conclusion, President Johnson said that he believed that the future material prosperity of the country is very largely dependent on how this society solved the problem. "Let us see to it," he said, "that our ship of state shall be guided by the lights which are now so successfully leading others through the channels of progress, rather than to continue to steer by the vanishing lights of a unique and tortuous past, which may soon land us on the sandy banks of delusion and improvidence."

The first paper read was by Gaetano Lanza, professor of Applied Mechanics, Massachusetts Institute of Technology, on "The Classroom and the Laboratory in Their Mutual Adjustment to the End of the Most Efficient Instruction." In the course of his remarks he said: "In giving a student an engineering education we wish to fit him, as far as possible, so that he may grapple successfully with the duties and responsibilities of his profession, not only those of a technical nature, but also those which he must as-

sume as an engineer and as a man. The study of pure science and literature should not be neglected in his training. To impart to the student a thorough mastery of scientific principles is of far greater importance than anything else that can be done for him, and this is the chief function of the engineering course.

"Without laboratory work the modern development of our engineering schools would have been impossible; for the laboratory work has not merely served to illustrate and elucidate the classroom work, but has also reacted upon it and caused the classroom work to be so modified as to accord with the facts, and thus has produced an enormous development in the classroom work itself.

"The functions of the engineering laboratory are partly to emphasize and illustrate the work of the classroom and partly to drill the students in performing carefully and accurately such experimental work as they are liable to be called to perform in the practice of their professions."

In a paper on "Some Phases of Engineering Education in the South," J. J. Wilmore, of the Alabama Polytechnic Institute, told of some of the peculiar difficulties which beset engineering educators in this section. He said in part:

"The problem of preliminary preparation is one the solution of which all can share. In some of the States of the South, however, it is more trying than elsewhere. This problem, complicated by the demand for a multiplicity of other subjects, makes the arrangement of a satisfactory course of study difficult. No college ever yet had as much money as it needed, but in the South the lack of funds is much more keenly felt than in other sections. The statistics of colleges in both North and South, nine colleges in each section being selected, as being as nearly representative as possible, show relatively the conditions in the two sections. The average income from the Northern student is $242 and from the Southern student $172. The average number of students per instructor in the Northern colleges is 10.7, while in the Southern colleges it is 12.

"The inertia of the old prejudice of practice against theory is still an important factor in Southern industrial management. The conditions, however, are improving from year to year, and the future prospect is far from discouraging."

The meeting in Huntington Hall in the evening was addressed by Dr. R. H. Thurston, of Cornell University, who spoke on "The Correct Theory and Method of Oraganization and Conduct of Professional Schools." Dr. Thurston considered the subject very generally, and then considered the special methods applicable to the different kinds of professional schools.

A paper read during the second day's session by W. K. Hatt, professor of Applied Mechanics at Purdue University, was of exceeding interest. Its subject was "A Laboratory Apparatus for Impact Experiments." Professor Hatt said that the longitudinal impact is produced by the fall of an 845 pound cast-iron weight or hammer on a specimen steel rod. This rod is held at each end by conical wedges fitting in steel bushing pieces. The hammer is fixed to the lower end of the specimen, the lower bushing bearing against a shoulder made in the core of the hammer. The combination of bushing, rod and hammer is lifted to a desired hight and then released. The upper bushing is caught in the descent by cross-pieces, fixed to the uprights of the apparatus and the rupture of the specimen steel rod results. The circumstances of the impact are recorded on a revolving drum by a pencil attached to the hammer. The resulting curve furnishes data from which the ultimate resilience, elongation and time of impact are obtained.

The first regular passenger car to pass over the entire trackage of the Boston Subway was started in the afternoon in front of the Public Library loaded with members of the Engineering Society. At the power house on Albany street the visitors were conducted through the extensive plant, with its engines and dynamos capable of developing 25,000 horse power. Here some time was spent in the inspection of the plant, with all its modern appliances, after which the car proceeded to the Copley Square Hotel.

The last day of the meeting Henry S. Jacoby, associate professor of Bridge Engineering and Graphics at Cornell University, read a paper on the construction of models by students as an aid in teaching descriptive geometry. The paper was necessarily technical. The value of the model was asserted to lie in securing at the beginning of one's course a clear conception of the relation of the figure in space to its projections. Models are sometimes indespensable for an easy solution of special problems.

On Monday, August 22, the fiftieth anniversary meeting of the American Association for the Advancement of Science assembled in Huntington Hall of the Institute of Technology. The meeting of the association lasted through the week, being divided into nine sections to facilitate and specialize the work. In the sections of Physics and Mechanical Science and Engineering about eighty timely papers of recent advancements along those lines were read. The feature of the week was a paper by Charles F. Brush, inventor of the first successful arc lighting system, of Cleveland, Ohio, on the discovery of a new gas in the atmosphere, and pervading space in general. According to Mr. Brush this gas supersedes the fluid popularly called ether, and hence is named by its discoverer "Etherion." Many scientists regard this discovery as one of the most important of the century.

Commercial Review.

NEW YORK, Friday Evening, September 2.

THE MACHINE TOOL MARKET.

The activity which has characterized machine tool manufactories of late continues in the West, and, so far as our inquiries have extended, in the East also. It would not appear that shops are very generally running on double turn, but they maintain full day hours with a full force. The vital question is whether new orders are coming in to take the place of those completed, and hence whether the fire of energy in tool construction will not soon burn out.

An official of one of the leading machine tool companies in Cincinnati, who called at our office recently, remarked that while it is true that tool manufactories are busy, it is largely upon the execution of old orders, and new ones are not coming in as fast as might be desired. We prefer to believe, however, that this is no more than a corollary to the hottest month of the year, which, being now fairly over, will be ushered out to make room for a fresh demand. It is fortunate that the shops have been tided over the summer so satisfactorily.

Perhaps the view above quoted is too pessimistic. Our Cincinnati correspondent is very cheerful. Furthermore, we have been talking with a man who has just taken a trip through the machinery districts of Cincinnati, Cleveland, Buffalo, Toledo and elsewhere for the purpose of buying tools, and, in reporting that the manufacturers of metal-working machinery are busy in their mechanical operations, he states that a number of them remark an increase in domestic orders, so that upon the whole the situation gives some show of improvement on the office side. He says that everywhere he has found it difficult to obtain standard tools for prompt delivery. This shows that the work being done is in the execution of actual contracts and that manufacturers might well afford to have a little time allowed them for the accumulation of stocks for future emergencies.

One thing which in particular caught the attention of the party alluded to was the remarkably large proportion of the work that was being done for export. Of the percentages of this class of business in the whole output of the respective shops, the maximum named was 80 and the lowest 50.

In the New York machine tool market the months of July and August have both been comparatively quiet, and between them there was not a great deal to choose. There is, however, a sufficiently strong current of report to warrant us perhaps in thinking that the more recent weeks have shown some gain over the earlier, that inquiry is better and that, although the end of the war has as yet brought no manifest boom, either that or the approach of fall or both are infusing a little

more energy into trade. But the weather that has reigned all summer and bids fair to extend well into the autumn is sufficient to blight anything, even machine tools.

Large machines are still in relatively good requisition and prices are stiff. There is some intimation that Southern railroads are showing their heads above water.

We call the attention of manufacturers of nut and bolt machinery to the advertisement of the Helicoid Locknut Patents (Parent) Company (Limited), appearing in another column, to the effect that it is in the market for machinery of this description for new works in England, now being fitted up. The particular locknut made by the above-named company was, it may be remembered, described in the "American Machinist" of March 24, 1898. The door seems to be open for some American manufacturer to obtain an order of considerable magnitude.

We learn that the Niles Tool Works, Hamilton, Ohio, are enjoying at present a very flattering degree of activity in business.

Some of the machine tool and other factories, in equipping new plants or improving old ones, are introducing roller bearings. The Hyatt Roller Bearing Company has within a short time received orders for its flexible roller bearings to be put in the works of the Cincinnati Milling Machine Company, and R. K. Le Blond, of Cincinnati; Beaman & Smith, of Providence, and the Wilmot & Hobbs Manufacturing Company, of Bridgeport, Conn.

An agent for several American manufacturing companies has written from Hamburg to the effect that there are prospects for a heavy demand from there for machine tools and other mechanical devices during September and October. In many manufacturing districts of Germany manufacturers are receiving so much home trade that there is likelihood of some good orders reaching America. The writer added that he knew of some business just about on its way to America that would involve many thousand dollars' worth of machine tools, etc.

MISCELLANEOUS.

For the narrow-gage railroad connecting Wangaratta and Whitefield, Australia, have been accepted American bids to furnish two sample locomotives, from which it is expected that any future engines to be built for the road in the colony will be imitated. The American bid was about $18,000—$1,500 below the lowest other offer—and the time required for completion was seventeen weeks in this country as compared with fifteen months in England.

Trade with Cuba has already opened to a considerable extent, but so far it has been principally in provisions. Exports for the week ending August 30 were $497,498, more than 98 per cent. being food products. A consular report from Jamaica, on which island a trade depression is now existing, states that the people are desirous of entering into a reciprocity treaty which will bring them into closer business relations with the United States.

The United States consul at Vera Cruz, Mexico, furnishes to the Department of State the following statistics of imports of machinery and apparatus at that city: From July, 1894, to June, 1895, $1,393,997 worth; from July, 1895, to June, 1896, $1,666,553; from July, 1896, to June, 1897, $1,432,371.

Chief Wadlin, of the Massachusetts Bureau of Statistics, has issued a summary of the value of goods made and work done in the last three years. It includes machines and machinery for 1895, $33,492,848; 1896, $36,661,271; 1897, $32,412,230. Metals and metalic goods, 1895, $40,297,809; 1896, $38,633,596; 1897, $37,609,806.

CHICAGO NOTES.

The Chicago branch of the E. P. Allis Company has been obliged to decline, during the past two months, more business than it has accepted, mainly because the desired deliveries could not be made.

The Gates Iron Works recently accepted an order from London, England, for nine ore crushers.

The Ames Iron Works have recently sold to the American Glucose Sugar Refining Company, Waukegan, Ill., three engines—two of 250 horse-power each and the third of 135 horse-power. The engines are for a new plant, which will be thoroughly equipped with modern appliances in about thirty days.

CINCINNATI REPORT.

Through the month of July sales of pig iron were very slow, and orders few and for small amounts. Though prices were low, consumers who had stocks on hand sufficient to last for some time did not choose to buy even at extra inducements. Others who had iron still due them on old orders had no occasion to enter the market. During August, however, quite an improvement was seen in inquiries and sales, and trade was fairly active. Prices also were on the move upward. While many orders were for 500 tons, a good number were received of from 1,000 to 3,000 tons. The demand for No. 2 foundry is so good that orders for it have come in freely at $7.50, at furnace; books are well filled with orders and furnacemen claim that they do not care for any more at the price named. Further advances all along the line are expected.

With the improved prices for pig iron have come advances in finished iron and steel generally. Inquiries and orders secured are better, and figures still higher are anticipated.

In a general way the attention of the people here in Cincinnati is taken up with the meeting of the Grand Army of the Republic in this place next week, when 50,000 to 100,000 people are expected, and ordinary business may, in consequence, be somewhat neglected. Yet since among the visitors will be iron and steel producers and machinery dealers they may avail themselves of the opportunity to place orders.

After a comparative lull and quietness in the demand for machine tools and other machinery in July, August showed some improvement in conditions, owing to a brightening national horizon, which was reflected upon the order books of some manufacturers. Certain concerns tell us that their business for the first eight months of this year has been 30 to 100 per cent. in excess of that of the corresponding period in 1897, and that prospects indicate that trade will keep up very well during the remainder of the year.

The American Tool Works Company has lately shipped a good many large

(*Continued on page 37.*)

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Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Conn.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Cutters, reamers and small tools, regular and special; vertical millers, cutter and surface grinders, shears and punches. R. M. Clough, Tolland, Conn.

Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Situations Wanted.

Automatic machinery designer; 6 years' best experience; graduate. Box 185, AMERICAN MACHINIST.

An experienced steam and gas engine designer wants position as superintendent. Box 216, AM. MACHINIST.

Mechanic and draftsman wants position as foreman or supt. toolroom or light machinery, can furnish best reference. Address Box 220, AMERICAN MACHINIST.

A first-class mach. and draftsman wants position as foreman or assist. supt of machine shop; has held positions as general foreman; best of references furnished. Box 208, AMERICAN MACHINIST.

Planer foreman, 18 years exp. building lathes, planers, radial and multiple drills, &c., wants position; thoroughly familiar with modern methods of turning off work. Box 210, AMERICAN MACHINIST.

Superintendent or manager is open for position; practical mechanical engineer with office and business exp.; can handle office or shop or solicit trade; good character; ref. Address Box 218, AM. MACHINIST.

Wanted—By an experienced mach. and draftsman, a position of responsibility, either in the shop or on the road setting up machinery; has served as general foreman; can furnish first-class references. Box 209, AMERICAN MACHINIST.

A mechanical engineer desires to make a change after October 1; is well up in modern shop practice and has commercial as well as mechanical ability; engines, boilers and appliances a specialty. Address Box 217, AMERICAN MACHINIST.

Mechanical engineer now located in New York State, accustomed to handling correspondence, desires position in charge of city office, or would accept position as first assistant with good concern; excellent references. Address Box 219, AMERICAN MACHINIST.

Wanted—Position of responsib'y by an active, enterrising and exp. mech'l eng'r, aged 40, who for many years was sup't of a large eng'r'g works; is thoroughly versed in business methods as well as techn'l matters, and the systematic h'dling of men; member A. S. M. E.; traveling pos'n acceptable. Box 215, AM. MACHINIST.

Help Wanted.

Wanted—A first-class draftsman to design automatic machine tools such as tapping machines for fittings. Address Box 214. AMERICAN MACHINIST.

Wanted salesman for high class steam plants, tech. graduate preferred; send outline of experience in designing, selling, erecting and testing out high duty plants; also send full line of references. Address Box 212, AMERICAN MACHINIST.

Wanted immediately an up to date, exp. foreman of machine shop; one accustomed to heavy marine engine work; will consider only first-class man, with satisfactory references. Apply by letter to the Harlan & Hollingsworth Company, Wilmington, Del.

Wanted—Young man as assistant draftsman on boiler, tank and general jobbing work, principally from specifications; rapidity and accuracy more desirable than designing ability. Give age, experience and sal. wanted. Struthers, Wells & Co., Warren, Pa.

Wanted—By a company mfg. a general line of engine work, ambitious young men who have served their regular apprenticeship and are looking for a permanent position in a shop where faithful service is appreciated; in replying state size and kind of machine and work you are most accustomed to; state wages desired. Engine Company, care of AM. MACHINIST.

Wanted—A supt. for a well-established machine tool factory employing about 75 hands; must be a thorough mechanic and able to produce the highest grade work at a competitive cost; a good judge of men and a worker; only those having the necessary qualifications would have any chance to succeed, as the factory is owned and managed by practical mech. Address, giving age, exp., married or single, salary expected and references, Box 205, AMERICAN MACHINIST.

Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Philadelphia Book Co., Phila., Pa., catalog free.

Dies and press tools. J. L. Lucas, Providence, R. I.

Best Calipers, Levels, etc. E. G. Smith, Columbia, Pa.

Book, Dies & Die Making, $1. J. L. Lucas, Prov., R. I.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

We have foundry, pattern and machine shop 175 miles northwest of Chicago, and solicit orders for first-class work at lowest prices. Box 213 AM. MACHINIST.

Gasoline Engines, all sizes, 1 to 60 H. P.; send for circulars, terms and prices; castings fur. to build your own engs. Dirigo Eng. & Mach. Works, Portland, Me.

The advertising department of the American Machinist has on hand 20,000 draftsman's thumb tacks; will send a box of ten to any draftsman in America on request; could use a postage stamp on box, but will send the tacks anyway.

Institutions retiring from business having machine tools, brass or wood working machinery, will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach Co., 55-59 Woodbridge st., W., Detroit, Mich.

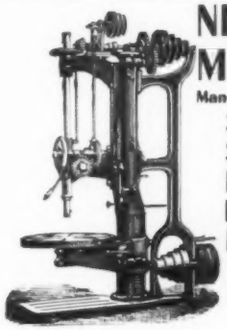
The CROSS OIL FILTER

actually reduces oil bills 50% or more. Sent on approval. Capacities 3 to 120 gals. per day. Used in 18 countries. Testimonials from the leading firms in every field of industry.

THE BURT MFG. CO.
AKRON, OHIO, U. S. A.

Business Established 8 Years.

Largest Manufacturers of Oil Filters in the World.



NEW HAVEN MFG. CO.

Manufacturers of

SHAPERS,
SLOTTERS,
PLANERS,
LATHES,
DRILLS, Etc.

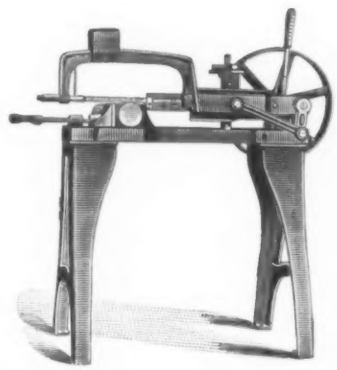
NEW HAVEN, CONN.

"The best is as good as any."

The New

Automatic and Gravity **Feed**

Q & C Shop Saw



Cuts { Tool Steel, Machinery Steel, Iron, Brass and All Other Metals.

Price—'Way Down.

Quality—'Way up.

Shop Saws,

Portable Rail Saws,

Cold Power Saws,

For All Purposes.

Send for Catalogue.

Q & C Company,

Chicago. New York.

LONDON: Chas. Churchill & Co.
PARIS: Hounsfield & Fils.
BERLIN: Schuchardt & Schutte.
MADRID: J. G. Neville & Co.

(*Continued from page 36.*)

lathes to St. Petersburg. Late orders include one for machine tools to the value of $10,000, to be sent to the Maime Institute, Warsaw, Russia; one from London for twenty-five assorted machines and one from Germany for $22,000 worth of lathes, planers, drills, shapers, boring mills, etc.

The Bickford Drill & Tool Company experienced a very gratifying August trade, which was much in excess of that of a year previous. They have a full force of men at work on full and over time.

Rahn & Mayer find their business for August much better than last year, and they have all that they can do, with their present facilities, to keep up in filling orders. Export trade has made a notable gain with them and domestic has improved somewhat. Their orders so far this year amount to nearly double those for the corresponding period last year.

The Bullock Electric Manufacturing Company reports business very good indeed and principally composed of home orders. The company has not hitherto given especial attention to the foreign field, but hopes to cultivate it after occupying the new plant, which, it is thought, may be by October 1.

The Bradford Belting Company is doing a very good business this year, showing some gain over last. The trade of August has held on well for a summer month.

R. K. Le Blond has not yet moved to his new building at Linwood, near Cincinnati. His August trade has been quite large, and he has kept sixty or more men employed. While exports are increasing, the home demand is receiving additions all the time. The two-thirds of this year just closed show an increase of nearly 100 per cent. over the first two-thirds of 1897.

E. K. Morris & Co. have experienced an increase of some 25 per cent. in their trade this year, confined entirely to domestic orders. They are the recipients of a good and growing demand for hand-cut files.

The Wais & Roos Punch & Shear Company has done a good business to date this year, and has lately noticed an improvement in inquiries. Owing to the heavy nature of their machinery their business is chiefly domestic.

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Quotations.

NEW YORK, Saturday, September 3.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 25 @ 11 50
No. 2 foundry, Northern	10 75 @ 11 00
No. 2 plain, Northern	10 25 @ 10 50
Gray forge, Northern	9 75 @ 10 00
No. 1 foundry, Southern	10 75 @ 11 00
No. 2 foundry, Southern	10 50 @ 10 75
No. 3 foundry, Southern	10 25 @ 10 50
No. 1 soft, Southern	10 75 @ 11 00
No. 2 soft, Southern	10 75 @ 11 00
Foundry forge, Southern	9 50 @ 10 00

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.05 @ 1.10c.; refined, 1.13 @ 1.20c. Store prices: Common, 1.25 @ 1.35c.; refined, 1.30 @ 1.50c.

Tool Steel—Base Sizes—Standard quality, 6 @

(*Continued on page 38.*)

(*Quotations continued from page 37.*)

7c., with some brands perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.45 @ 1.50c.

Cold Rolled Steel Shafting—Base sizes, from store, 2.20@2.25c., according to quantity.

Copper—Carload lots; Lake superior ingot, 12½c.; electrolytic, 12¼c.; casting copper, 12c. for ordinary brands.

Pig Lead—Carload lots, 4.05 @ 4.10c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, 16.15 @ 16.25c., f. o. b.

Spelter—Carload lots, 4.75 @ 4.85c., New York delivery, for ordinary brands.

Antimony—In cask lots: Cookson's, 9½ @ 9¾c.; Hallett's, Japanese and French E. B., 9c.; United States, 8¾c.

Lard Oil—Prime city, ice pressed, 45 @ 46c., in wholesale lots.

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Manufacturers.

The Gisholt Machine Company, Madison, Wis., is to erect a new factory.

The Nes Chain Manufacturing Company, York, Pa., will add an addition to its works 60x30 feet.

The Hollingsworth & Whitney Company contemplates the erection of a new pulp mill at Winslow, Me.

Work on the new mill of the Remington Paper Company is going on rapidly at Glen Park, N. Y.

The Litchfield Shuttle Company, Southbridge, Mass., is enlarging its works by an addition 32x28, three stories.

An addition, 70x61 feet, three stories high, is to be built to the Astoronga manufacturing plant, Little Falls, N. Y.

Victor Mackiewicz will build for the Atlantic Refining Company, Philadelphia, Pa., a one-story brick boiler house, 41.4 by 70 feet.

The manufacturing plant of the American Cutlery Company, Chicago, Ill., was recently burned. Considerable damage resulted.

The Lansdowne (Pa.) Electric Light Company has begun the erection of its new plant, the main building of which is to be 42x82 feet.

Burk Brothers started recently to build a four-story brick morocco factory, 62x185 feet, at Nos. 935 to 941 North Third street, Philadelphia, Pa., to cost $30,000.

The Marsden plant, Chester, Pa., has been purchased by the Standard Plaster Board Company, of Philadelphia, and extensive improvements are to be made to it.

The contract to build the new paper mill for the Oswego Falls Pulp & Paper Company, Fulton, N. Y., has been awarded to H. P. Cummings & Co., of Ware, Mass.

The Black Manufacturing Company, Erie, Pa., took out a permit recently from Building Inspector Spencer's office for a three-story brick and iron bicycle factory.

The King, Gilbert & Warner Company, Columbus, Ohio, has closed a contract for 15 acres of ground, and will at once enter upon the work of largely extending its plant.

The Berlin Iron Bridge Company, East Berlin, Conn., is erecting a new boiler house on the estate of C. M. Robertson, Montville, Conn. The building is about 50 feet square.

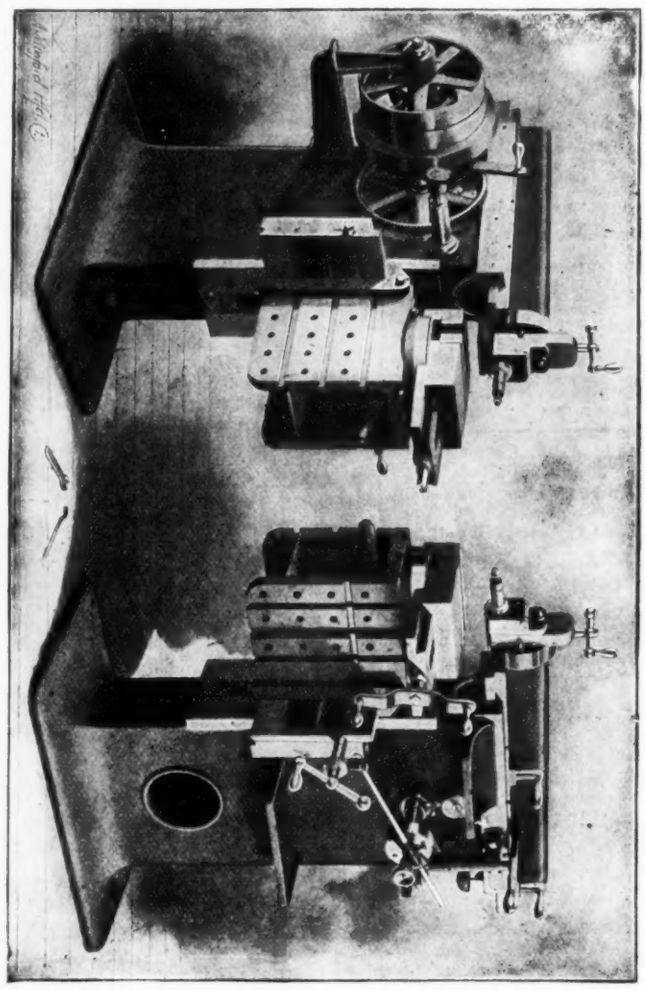
John Kramer & Son have been granted a permit to build the additions and alterations to the factory of J. W. Paxon & Co., Nos. 1056 to 1078 Beach street, Philadelphia, Pa.

Ground has been broken for a large addition to the boiler house and for an additional blooming mill at the plant of the Lorain (Ohio) Steel Company.

The managers of the American Plate Glass Company at Alexandria, Ind., are makng ar-

15-inch Pillar Shaper.

A FRICTION driven machine, fitted with a positive locking device for friction, insuring a uniform length of stroke under a heavy cut. Stroke can be changed to any position with ram in motion; has quick return; and our micrometer adjustment makes possible the most minute variation in length of stroke, which can be constantly varied with machine in motion; an especially valuable feature in tool and die work and in planing to irregular lines.



THE HENDEY MACHINE CO.,

Torrington, Conn.

AGENTS FOR THE PACIFIC COAST:

PACIFIC TOOL AND SUPPLY CO., ... San Francisco, Cal.
J. W. CREGAR, ... Philadelphia Bourse Exhibition.

EUROPEAN AGENTS:

SCHUCHARDT & SCHUTTE, ... Berlin, Vienna, Brussels.
CHAS. CHURCHILL & CO., Ltd., London and Birmingham, England.
ADOLPHE JANSSENS, ... Paris, France.

Renshaw's Ratchet Drills, Nos. 1 and 3; ***Upright Drilling Machines,*** single and multi-spindle, both those in which the spindles are without feed movement and tables are operated by hand or foot lever, and those in which the tables have provision for adjustment, and spindles are fed by hand lever, or by hand wheel, or automatically; also, ***Horizontal Drilling Machines,*** single and multi-spindle. Ask for the Machinists' Catalogue.

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THE PRATT & WHITNEY COMPANY,
HARTFORD, CONN., U.S.A.

New York, 123 Liberty St. Boston, 144 Pearl St. Chicago, 42 South Clinton St.
London, Eng., Buck & Hickman, 280 Whitechapel Road.
Paris, France, Fenwick Freres & Co., 21 Rue Martel.

ENGINE and SPEED LATHES

IN VARIOUS LENGTHS—9 to 15 in. SWING.
Latest and Most Approved Designs. Workmanship, Material and Finish of the Highest Order.

SEBASTIAN LATHE COMPANY,
117 and 119 Culvert Street, CINCINNATI, OHIO, U. S. A.
Agents: SELIG, SONNENTHAL & CO., London, Eng.; JOHN TRAGARDH & CO., Goteborg, Sweden; E. SONNENTHAL, Jr., Berlin, Germany; R. S. STOKVIS & ZONEN, Rotterdam, Holland.

Thermo-Dynamics of the Steam Engine and other Heat Engines.

By C. H. PEABODY,
Professor of Marine Engineering and Naval Architecture, Massachusetts Institute of Technology.
Fourth Edition. Rewritten and Reset.

8 vo, CLOTH, $5.00.

JOHN WILEY & SONS, 53 East 10th Street, New York City.

LIGHTNING CLUTCH DIE HOLDER.

For use in turrets of screw machines, screw plates, taps, dies, reamers, tap wrenches, bolt cutters, drilling machines, etc. **Send for Catalogue.**

WILEY & RUSSELL MFG. CO.,
Greenfield, Mass., U. S. A.

Agents in London;
SELIG, SONNENTHAL & CO., 85 Queen Victoria Street.

Excelsior Straight-Way Back Pressure Valve.

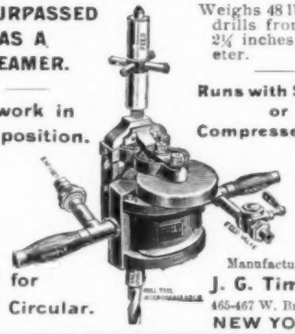
This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

JENKINS BROTHERS, New York, Boston, Philadelphia, Chicago.

MOFFET PORTABLE DRILL.

UNSURPASSED AS A REAMER.

Will work in any position.



Weighs 48 lbs. and drills from ½ to 2¼ inches diameter.

Runs with Steam or Compressed Air.

Send for Circular.

Manufactured by
J. G. Timolat,
465-467 W. Broadway,
NEW YORK.

Morton's Draw Cut Shaper with Keyseating Attachment.

If you do not have enough keyseating to employ a special machine this Shaper with attachment can do your work. It will cut a keyway ⅞ in. wide, ⅛ in. deep and 14 in. long; time 8 minutes.

MORTON MFG. CO., Muskegon Heights, Mich., U. S. A.

Eastern Branch: 126 Liberty Street, New York, N. Y.; Walter H. Foster, Manager.
Glasgow Office: 40 St. Enoch Square; James Ritchie, Manager.
Schuchardt & Schutte, Berlin, Vienna, Brussels.
Adphe. Janssens, Paris, France.

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F. B. PRATT, Secretary.

rangements to build an addition to their plant. A new casting hall 230x400 feet will be erected.

Henry & Allen, of Auburn, N. Y., was incorporated recently with a capital of $25,000, to manufacture machinery.

The Menominee (Mich.) Electrical & Mechanical Works have recently built onto the factory and have inclosed an addition.

John Barth, of Milwaukee, will erect a mill at Keystone, S. Dak., in the near future for the treatment of the ores of the Bismarck mine, a large body of which has recently been opened.

The New England Economic Company has been incorporated and will do business in New Haven, Conn. The directors are James Acton Miller, Horatio H. Lord and Harry E. Darrows.

Messrs. Pollitt and Evans, of the Gwynneville, Ind., Gas Company, who are now in England, will return the first of September, and contemplate the erection of a starch plant at that place.

The E. S. Stiles Press Company, of Watertown, N. Y., has opened an office at 243 Centre street, New York city, at which place the company is represented by Mr. C. Lester Cullingworth.

Messrs. Ed. P. Rogers and George B. McC. Rogers, proprietors of the Excelsior Foundry, Belleville, Ill., have decided to erect a new foundry, and to that end have purchased additional ground.

Estimates are being received for the erection of a brick, stone and iron power house for the Philadelphia Commercial Museum, on the old Almshouse lot, bounded by University and Vintage avenues, Philadelphia, Pa.

W. H. Bliss & Son, the contractors for the improvements at the "lower mill" in Burnside, Conn., have a large force of masons at work on the addition to the mill building, and will probably complete it by October 15.

Contractor Charles McCaul took out permits to build two five-story brick factory buildings, 73x128 and 59½x172 feet, for Thomas Potter, Sons & Co., at their oil cloth works, Second street and Erie avenue, Philadelphia, Pa.

The Massey-Harris Company, Toronto, Ont., has taken out permits for the addition to their premises of a single story brick molding shop and a two-story brick core shop on the south side of King street, west of Massey street.

The High Falls Sulphite Pulp and Mining Company, at Pyrites, N. Y., near Canton, was recently destroyed by fire. All the machinery used for making pulp, together with the store house and $5,000 worth of pulp, was destroyed.

Improvements which will cost about $30,000 are being made by the Binghamton Gas Company, Binghamton, N. Y., at their gas plant on Upper Court street. The improvements include an addition to the brick building and the purchase of new machinery.

The National Manufacturing Company, of Cleveland, Ohio, has been incorporated to manufacture articles of all kinds made from metal. Capital stock, $100,000. Incorporators, W. D. B. Alexander, Dallas Elliott, O. M. Stafford, O. S. Werntz and F. L. Gelelein.

The plant of the Linton Coated Paper Company, three miles east of Richmond, Va., was totally destroyed by fire recently, entailing a loss of $30,000 or $40,000. The plant was owned by the Richmond Paper Company, and Mr. Joseph Linton was the superintendent.

F. H. Stevens Company has been organized at Kittery, Me., for the purpose of manufacturing and selling steel type and dealing in printers' machinery, etc., with $10,000 capital stock, of which nothing is paid in. The officers are: President, F. H. Stevens, of Gloucester, Mass.; treasurer, Frank E. Rowell, of Kittery.

A rod mill is to be erected in Pittsburg. It will be built and controlled by the Schoenberger Steel Company at Fifteenth and Etna streets, and the work of its construction will begin at once. The mill will be completed

within six months and will have a capacity of about 400 tons every twenty-four hours.

Robert Wetherill & Co., Chester, Pa., the engine builders, will erect a foundry in the fall. It will be 145 x 65 feet. The new cupolas will have a capacity of 30 tons each. Press of work makes the new foundry necessary.

The Hay & Hotchkiss Company, New Haven, Conn., has purchased the plant formerly occupied by the Manville Carriage Company, New Haven, Conn., and will immediately begin the manufacture of motor vehicles. They will require both new and second-hand machinery.

Estimates are being taken on a five-story and basement brick and iron factory building to be erected at 249 and 251 North Sixth street, Philadelphia, Pa., for Gustave Bisler. It will be equipped by the owners with improved machinery and will measure 70x120 feet.

William Steel & Son have requested bids on several factory buildings to be built at Toronto, Canada, for the Toronto Carpet Manufacturing Company. They will be of brick and iron, three stories and basement, and a boiler and engine house will be erected alongside the main building.

A new manufacturing firm has secured the McKee & Webb shops near the Lehigh Valley station, Cortland, N. Y. It will be known as the Cortland Specialty Company and will be under the management of J. Hub Wallace and William Hout. Carriage specialties will be manufactured.

Articles of incorporation for a new machinery company were filed recently. The company, which will be known under the title of the Los Angeles Machinery Company, has incorporated with a capital stock of $10,000. The incorporators are B. F. Williams, Walter Jones, Charles N. Williams, Theo. E. Eisen and C. Leonard.

The G. S. Blake Manufacturing Company, on First street, Cambridge, Mass., proposes to erect in the rear of the present works a new building of fireproof construction throughout, the materials to be brick and iron, with a hight of three stories and covering an area of about 7,500 square feet. In the center the building will be open to the roof, to accommodate overhead cranes worked by electric power.

C. E. Rahn, of Philadelphia, Pa., has plans drawn for a factory plant which will be built at Toronto, Ont. The main building will be three stories high and measure 215x53 feet, with a wing to be 68x40 feet; the dye house and storage house will measure 100x70 feet; the engine and boiler house 65x45 feet, and the sulphur house will measure 12x42 feet. The buildings will be constructed of brick, stone and iron.

Upon the tract of eleven acres lying north of its present plant the Deering Harvester Company, Chicago, recently commenced the construction of an addition. The work now being done is upon the five-story building to be devoted to the uses of the enameling department, but it is reported that at least ten large buildings will later be erected and at a cost variously estimated at from $500,000 to $1,000,000.

The Leechburg Foundry and Machine Company, formerly of Leechburg, Armstrong County, Pa., will break ground for its new plant at Homestead, Pa., next week. All arrangements have been made for the erection of a $500,000 plant, and contracts are now being let for the buildings, electrical machinery, etc. The Shiffler Bridge Company, of Lawrenceville, will also break ground for the new plant adjoining the Leechburg plant. Both plants will occupy about twelve acres. The Leechburg Foundry and Machine Company will supply its plants with all modern electrical machinery, motors, etc., and its cranes, etc., will be run by electricity.

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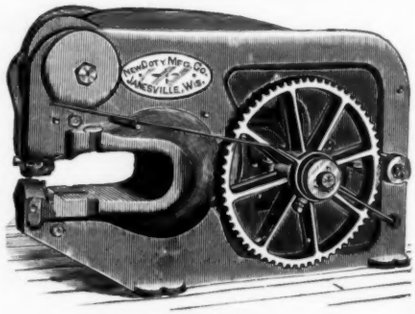

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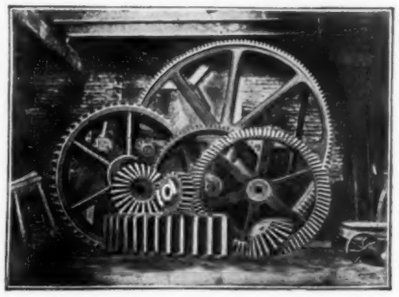

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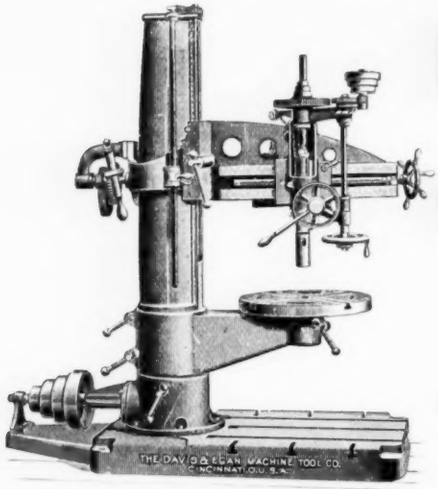

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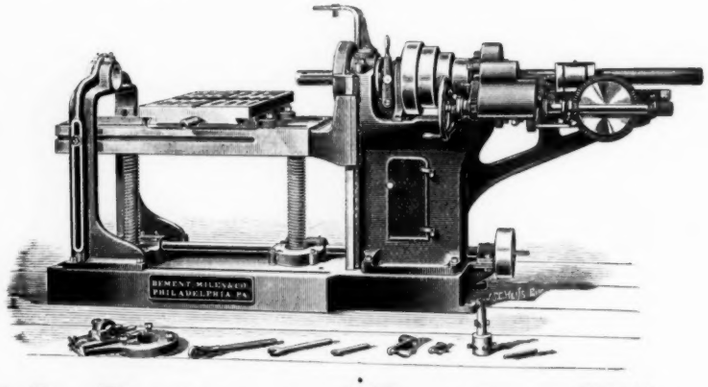

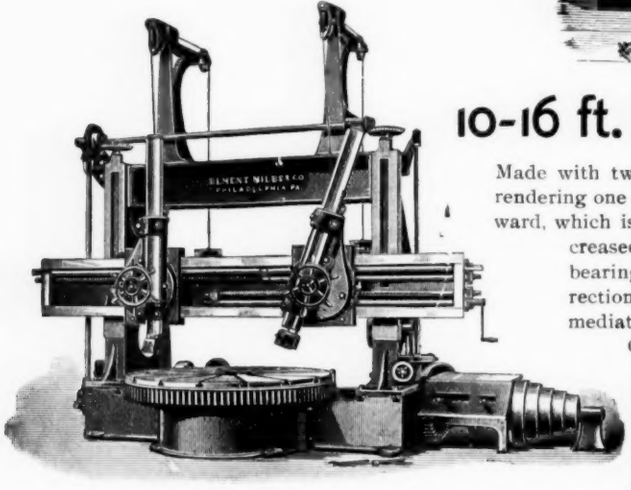

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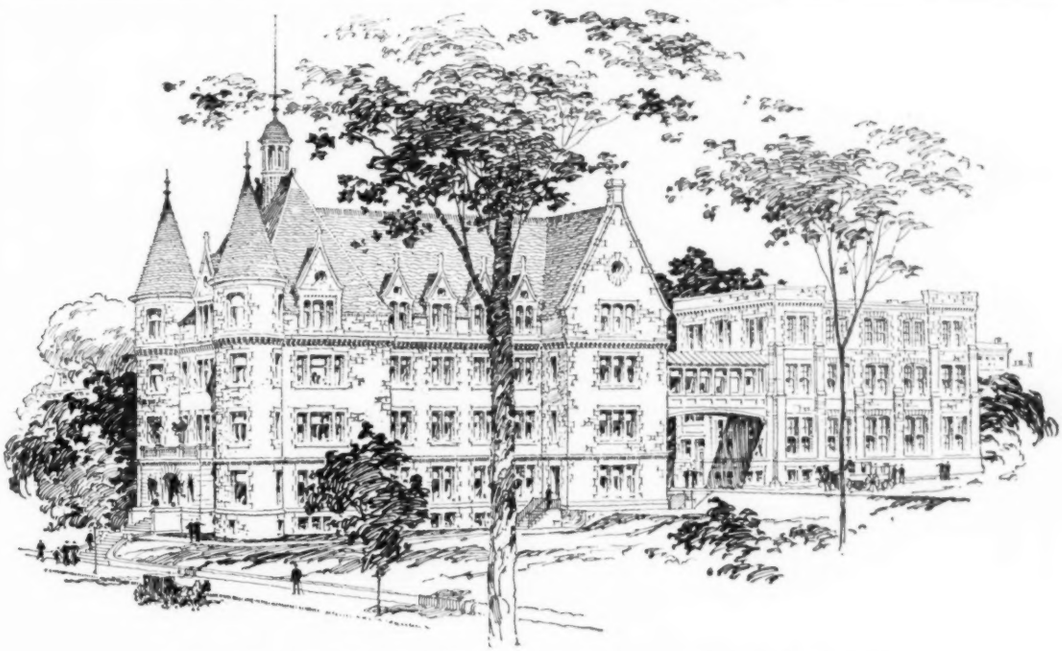

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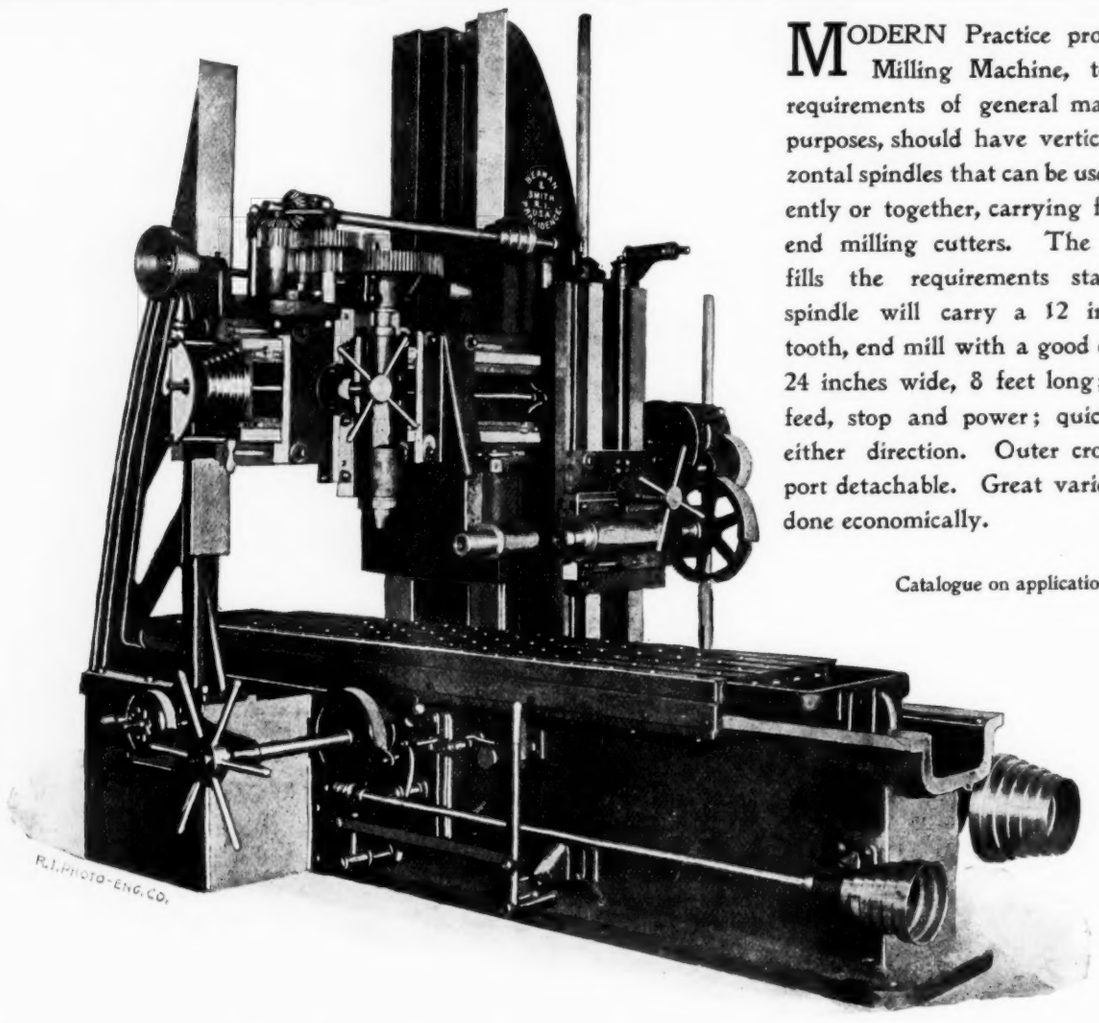

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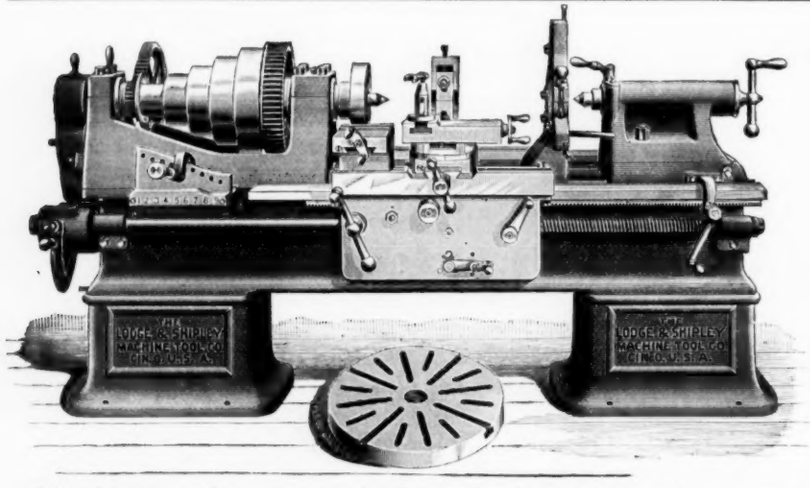

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- 30 in. x 10 ft. Rochester.
- 26 in. x 6 ft. Pond.

SHAPERS.
- 6, 9 and 24 in. stroke, crank motion.
- 15, 18 and 24 in. stroke, friction gd.
- 14 in. stroke, trav. head, Fitchburg.

DRILLS.
- Sensitive, Slate and Barnes.
- Gang, 2 and 3 spindle, Slate and Barnes.
- Uprights, 20, 25, 28 and 30 in. swing.
- Plain Radials, 54 and 88 in. swing.
- Universal Radial, 13 foot swing.

SCREW MACHINES.
- Pratt & Whitney No. 1, wire feed.
- Bardons & Oliver, Nos. 2 and 3 wire feeds.
- Jones & Lamson, 1 5-16 wire feed.

MILLING MACHINES.
- Plain No. 12 Garvin.
- Lincoln pattern, Ames & Co.'s, latest.
- Universal No. 2 Cincinnati, latest.
- Universal No. 15 Brainard, tool size.

MISCELLANEOUS.
- Brown & Sharpe No. 1, latest, 8x16 in.
- Brown & Sharpe No. 2, latest, 12 x 30 in.
- Horizontal Boring Machine, Nicholson, small.
- Boring and Turning Mill, 12 ft., Sellers.
- Presses, Bliss and Stiles, various sizes.
- Adt Riveting Machines, ½ in.
- Punches, Shears, Rolls, etc.
- Hammers, Power, Helve and Steam.

J. J. McCABE,
14 DEY ST., NEW YORK.

BARGAINS.

Second-hand Tools, good as new, used only a few months.

ENGINE LATHES.

One 12 in. x 5 ft. Silk lathe, good as new.
One 14 in. x 6 ft. Davis & Egan lathe, good as new.
One 16 in. x 8 ft. Draper lathe, good as new.
One 16 in. x 8 ft. Hatfield lathe, good as new.
One 18 in. x 6 ft. Davis & Egan lathe, good as new.
One 18 in. x 8 ft. Lodge, Barker & Co. lathe.
One 19 in. x 7 ft. Lodge & Davis lathe, good order.
One 20 in. x 12 ft. Davis & Egan lathe, good as new.
One 24 in. x 12 ft. Hatfield lathe, good as new.
One 26 in. x 14 ft. Fifield lathe, good order.
One 27 in. x 12 ft. Lodge & Davis lathe, good as new.
One 30 in. x 10 ft. Lodge & Davis lathe, good order.
One 38 in. x 20 ft. Lodge & Davis lathe, good order.
One 50 in. x 20 ft. Fifield lathe, good as new.

PLANERS.

One 22 in. x 22 in. x 6 ft. Flather planer, good as new.
One 24 in. x 24 in. x 6 ft. Davis & Egan planer, good as new.
One 24 in. x 24 in. x 10 ft. Davis & Egan planer, good as new.
One 30 in. x 30 in. x 8 ft. Pease planer, good order.
One 30 in. x 30 in. x 8 ft. Powell planer, good order.
One 36 in. x 36 in. x 12 ft. Smith-Silk planer, two heads, good as new.
One 42 in. x 42 in. 16 ft. Pond planer, 2 h'ds, good as new.

DRILLS.

One 25 in Standard drill, back geared, power feed, good as new.
One 28 in. drill, B. G. P. F. National, good as new.
One 32 in. drill. B. G. P. F. National, good as new.
One 72 in combination radial drill, good order.
One 4 ft. plain radial drill.
One 5 ft. Davis & Egan plain radial drill, good order

SHAPERS.

One 12 in Smith & Mills shaper, good as new.
One 15 in. Davis & Egan shaper, good as new.
One 16 in. Smith & Silk shaper, good as new
One 26 in. Davis & Egan shaper, good as new.

MILLING MACHINE.

One No. 2 Davis & Egan plain milling mach., good as new.

SCREW MACHINES.

One 7-8 in. screw machine, good as new.
One 1 1-4 in. screw machine, good as new.
One 1 3-4 in. screw machine, good as new.
One 2 1-8 in. screw machine, good as new.

MISCELLANEOUS.

One 16 in. x 5 ft. plain head Monitor lathe, good as new.
One 5 in. cutting-off machine.
One 30 in. pulley lathe.

THE AMERICAN TOOL WORKS CO.,
Successors to the Davis & Egan Machine Tool Co.,
Cincinnati, Ohio, U. S. A.

SECOND-HAND MACHINERY.

Sale Continued until September 1.

Contents of shops of the United Machine Co., Irvington, N. J. Twenty minutes from Newark by trolley line.
Inquire on premises, or at the Niles Tool Works Co., 136-138 Liberty Street, New York.
Stock consists of Lathes, Planers, Drills, Milling Machines, Shapers, Foot Presses, Drop Hammers, Printing Presses and Patterns, Shafting, Pulleys, Hangers, Engine and Boiler, Benches and Small Tools.

ENGINE LATHES.
13 in. x 6 ft., Ames
14 in. x 6 ft., Prentice.
15 in. x 5 ft., Sheperd.
16 in. x 7 ft., D. & H.
18 in. x 12 ft., Bogart.
27 in. x 12 ft., W. & L.
48 in. x 18 ft., G. & S.

SCREW MACHINES.
No. 2 P. & W., plain.
No. 1 C., wire feed.
No. 2 C., wire feed.
No. 2 1-2 P. & W., wire fd.
No. 4 Windsor, plain.
No. 2 Niles.
18 in. P. & W. Chucking Machine

PLANERS.
16 in. x 16 in. x 4 ft., Hendey.
22 in. x 22 in. x 4 ft., Pease.
24 in. x 24 in. x 6 ft., Powell.
26 in. x 26 in. x 5 ft., Powell, with chuck.
30 in. x 30 in. x 8 ft., Smith & Silk.
36 in. x 42 in. x 8 ft., Powell.
36 in. x 36 in. x 18 ft., Sellers.

SHAPERS.
9 in. traveling head, Sellers.
13 in. traveling head, Bement.
20 in. G. & E., circular motion.
20 in. G. & E., single geared.

DRILLS.
6-spindle Quint.
Pond Suspension,
No. 3 4-spindle Garvin.
32 in. G. & E., back gear.
34 in. Harris, back gear.
38 in. W. & L.

MISCELLANEOUS.
24 in. Lapping Machine.
No. 5 Water Tool Grinder, Springfield.
Centering Mach., Whiton.
Cutting off Mach., H. & R.
24 in. Gear Cutter, G. & E., half automatic.
Lincoln Type Milling Machine.
45 in by 12 ft. hor. Bor. and Drilling Machine.
36 in. Band Saw, B. & O.
Car Mortiser and Borer, B. & O.

We have named above only our choicest tools. Write us for anything you want.

Prices on application.

THE NILES TOOL WORKS CO.
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Ten new 22 in. x 13 ft. Blaisdell Pattern Lathes,

with compound rest and power cross feed,

$325.00 Each.

Send for photographs, dimensions and full description.

Send for our list of New Machinery.
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Marshall & Huschart Machinery Co.,
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FOR SALE.

All Modern Tools, in EXCELLENT CONDITION.

WRITE FOR OUR LIST, JUST COMING OUT.

SECOND-HAND GAS ENGINES.

1 16½ H. P. Slide Valve Otto Gas Engine, complete, with fly-wheel and belt pulley.....	$375
1 8 H. P. Otto Gas Engine, with iron base, complete, with fly-wheel and belt pulley.	200
1 8 H. P. Otto Gas Engine, without iron base, otherwise complete	175
1 7 H. P. Charter Gas Engine, with base, fly-wheel and pulley.....	200
1 3½ H. P. Gas Engine, Upright, with fly-wheel and pulley.....	125
1 2½ H. P. Olds Gas Engine, Upright, two fly-wheels and pulley.....	185
1 2½ H. P. Otto Gas Engine, Upright, with fly-wheel and pulley.....	140

S. M. YORK, Cleveland, Ohio.

We have rented

an additional warehouse at **No. 65** South Canal Street, and will place in same a large consignment of both new and second-hand Machine Tools, which will be offered at special prices.

Almost two hundred machines in stock.

Do not fail to write us before purchasing.

J. B. Doan & Co.,
68-70 South Canal Street, Chicago.

A FEW BARGAINS IN

Second-hand Machinery Just Secured.

ENGINE LATHES.
89 in. x 15½ ft. Lincoln, triple geared, a bargain.
62 in. x 22 ft. Putnam Machine Co., triple geared, good as new.
62 in. x 10 ft. New Haven, triple geared, pulley, chuck jaws fitted.
50 in. x 20 ft. Gay & Silver, triple geared, six section cone for 5 in. belt
32 in. x 14 ft. D. W. Pond, C. rest and P. C. feed.
25 in. x 10 ft. P. & W., C. rest and P. C. feed.
38 in. x 15 ft. Gage, C. rest and P. C. feed, raisers to swing 50 in
20 in. x 18 ft P. & W., plain gib carriage.
20 in. x 12 ft. D. W. Pond, plain gib and cross feed.
18 in. x 14 ft. Pratt & Whitney, plain gib rest.
17 in. x 8 ft. Putnam, R. & F. and P. C. feed.
16½ in. x 7 ft. Grant & Bogart, R. & F. weight rest.
Two 13 in. x 5 ft. P. & W. stud lathes.
A lot of Fox monitors, plain Fox and speed lathes.

PLANERS.
48 in. x 48 in. x 20 ft. Pratt & Whitney, one head, heavy pattern.
42 in. x 42 in. x 9 ft. Putnam, one head, as good as new.
42 in. x 42 in. x 16 ft. Bement, one head, a bargain.
32 in. x 32 in. x 8 ft. D. W. Pond, in fine order.
24 in. x 24 in. x 6 ft. Putnam M. Co., in good order
24 in. x 24 in. x 8 ft. Pratt & Whitney.
22 in. x 20 in. x 5 ft. Pratt & Whitney.
16 in. x 16 in. x 3½ ft. Walters, in fine order.
16 in. x 16 in. x 12 in. Whitcomb crank.

SHAPERS.
32 in. Prentiss friction, all parts.
24 in. Walcott shifting belt.
24 in. Hendey friction.
16 in. Betts, traveling head crank.
15 in. Hendey friction.
12 in. Warren, traveling head.
10 in. Pratt & Whitney crank.

MILLING MACHINES.
No. 2 Newton, Lincoln pattern
No. 2 Pratt & Whitney, Lincoln pattern.
No. 2 Brown & Sharpe, plain.
No. 2 Grant & Bogert, double column, plain.
No. 2 Cincinnati, plain.
No. 3 Garvin Machine Co., hand.
No. 1½ Pratt & Whitney, hand.

DRILLS.
7 ft. New York Steam Engine Co., radial, power lift and half universal.
4 ft. Betts radial, plain, back gears and P. feed.
34 in. Bickford, sliding head, no back gears.
26 in. Prentice Bros., back gears and power feed.
1-spindle Slates, sensitive.
2-spindle Norton, sensitive, power feed.
No. 5 Stow flexible shaft, complete.
No. 4 Stow flexible shaft, complete.

BORING AND DRILLING MACHINES.
Style E, Newark horizontal, 5 in. bar, really new.
Style D, Newark horizontal, 4 in. bar, 7 ft. table, has cross feed and can be used for milling, nearly new.
56 in. x 12 ft. Nicholson & Waterman, horizontal, two boring bars
33 in. N. Y. Steam Engine Co., car wheel borer.

MISCELLANEOUS.
No. 23 Kent punch, 24 in. throat.
No 3 O. S. drawing press (Stiles & Parker).
Three No. 2. drawing presses (Stiles & Parker).
D73 Ferracute press, 6 in. stroke.
4½ in. x 9 in. stroke, Miles steam hammer.
50 lb. Bradley power hammer.
80 lb. Bradley helve hammer.
One Davis keyseater.
Washburn twist drill grinder.
One ¼ in. Schlenker bolt cutter.
One ½ in. Putnam bolt cutter.
2 in. Saunders pipe machine.
2-spindle Whiton centering machine.

Send for complete lists of new and second-hand machinery in stock.

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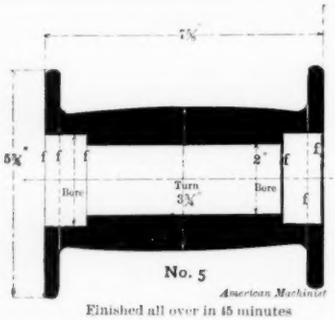
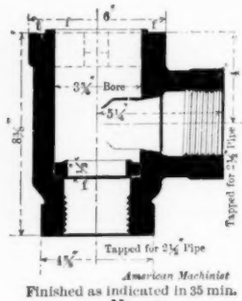
MACHINE TOOLS,
115 Liberty Street, New York.
BUFFALO OFFICE : 504 D. S. Morgan Building.



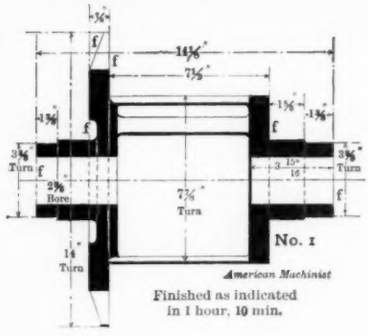
Finished all over in 45 minutes

"He who hesitates is lost."

This applies directly to the machine shop owner who, from some narrow-minded reason, refuses to investigate the money making merits of new and improved tools for the rapid and economical handling of work in the shop. Here are samples of work made on a Gisholt Turret Lathe and the time it took to make; just compare with the time it would take on a common lathe.



Finished as indicated in 35 min.
No. 11



Finished as indicated in 1 hour, 10 min.

Gisholt Machine Co., Madison, Wis., U. S. A.

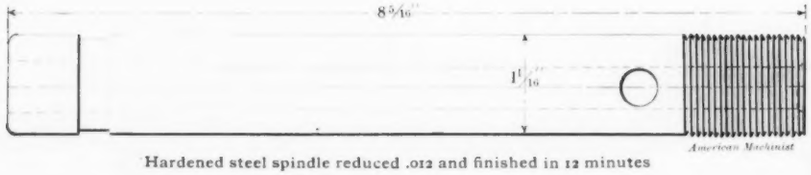
Eastern Branch, 126 Liberty St., New York; Walter H. Foster, Manager.
U. Baird Machinery Co., Pittsburg, Pa
C. W. Burton, Griffiths & Co., 1, 2, 3 & 4 Ludgate Sq., London, E.C., Eng.
Fenwick Frères & Co., 21 Rue Martel, Paris, France.
Schuchardt & Schütte, Spandauer-strasse 59-61, Berlin, C., Germany.
Schuchardt & Schütte, Breitegasse, 17, Vienna, VII., Austria.

There're over 8,000 of these clutches

in use and they're giving the best of satisfaction. That's because they're good clutches—the kind that are always ready—and will stand hard usage without going balky. They're the Frisbie Friction Clutch, and they're reasonable in price.

THE EASTERN MACHINERY CO., New Haven, Conn., U. S. A.

Some people are trying to handle



Hardened steel spindle reduced .012 and finished in 12 minutes

this kind of work on a lathe, and some wonder why the work cannot be done accurately. The reason is that the whole scheme of finishing this sort of work on a lathe is wrong. The only way to do it properly is by grinding, and Landis Grinders were especially designed for this purpose. Large book free.

Landis Tool Co., Waynesboro, Pa., U. S. A.

Hill, Clarke & Co., Boston and Chicago. Walter H. Foster, Manager, New York.
C. W. Burton, Griffiths & Co., London.
Ad. Janssens, Paris.
Schuchardt & Schutte, Berlin and Vienna.

A New . . . Turret Lathe

FOR FINISHING CASTINGS.

BEST MADE.

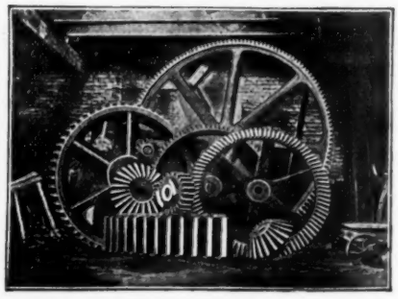
The American Turret Lathe Works Co.,

CHAMBERSBURG, PA.

T. SHRIVER & CO.,

IRON FOUNDERS,

333 East 56th Street, NEW YORK.



GEARS of any pitch, of any face, of any diameter,

MACHINE MOLDED.

NO PATTERN NEEDED.

$\sqrt{\frac{1875 \times \text{TANG. } 65°20'}{387}} = 2.193$

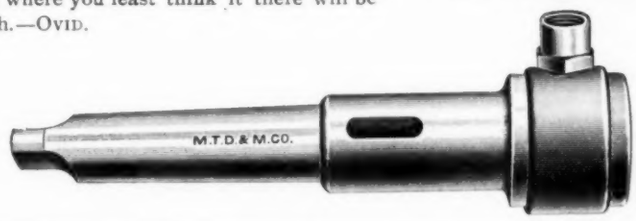
SOLVED ON THE "OMNIMETRE" WITHOUT THE AID OF TABLES.

THEO. ALTENEDER & SONS
PHILADELPHIA.

MORSE TWIST DRILL AND MACHINE CO.,

NEW BEDFORD, MASS., U. S. A.

Have your hook always baited; in the pool where you least think it there will be a fish.—OVID.



For information as to the use of drills with internal oil conduits, see insert between pp. 22-23 of our 1898 catalogue, a copy of which will be sent you on application. The style of the drills illustrated on pp. 22-23 has been changed since this catalogue was issued. The drills are now made with internal conduits to convey the oil to the point of the drills, thus doing away with the copper tube as shown in the catalogue cuts.

The Whitney Manufacturing Co., Hartford, Conn., U. S. A.

Most universal hand milling machine ever constructed.

The only one equally efficient for light and heavy work.

Our latest model machine has an adjustable weight attachment for feeding the head; by its use many vertical cuts may be made automatically, which allows an operator to attend more than one machine.

Schuchardt & Schütte, Berlin, Vienna, Brussels and Stockholm.
Chas. Churchill & Co., Ltd., London and Birmingham, England.
C. W. Burton, Griffiths & Co., 23a Ludgate Hill, E. C., London, England.
Fenwick Frères & Co., Paris.

18-inch Swing Screw-Cutting Engine Lathe

with Compound Power Cross Feed Rest.

Features: Five-step cone rod feed; power feed to compound rest; hollow spindles; slip pinion on feed-rod doubles range of feed; rack gear disengaged when nut-lock is engaged. Impossible to engage more than one feed at once. Send for new Catalogue B, showing our full line of improved tools, honestly made for heavy service and lots of it.

Draper Machine Tool Co. (Est. 1845),
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Sole European Agents:
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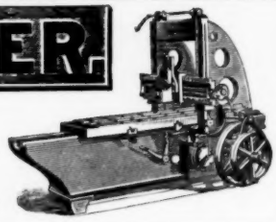
Plain gib rest, raise and fall rest and taper attachment furnished as desired.

Draper tools are strong and rigid, have large bearings and are first-class in every respect, and sold at a reasonable price.

Prompt deliveries, etc.

Correspondence Solicited.

THE GRAY PLANER.



The G. A. Gray Co.,

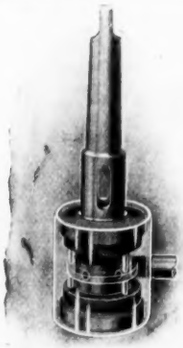
Cincinnati, Ohio,

Manufacture Planers as an exclusive specialty.
Planers only! Nothing but Planers!!

William Sellers & Co. Incorp. PHILADELPHIA.

NOTE.—An important feature of our **MODERN LABOR-SAVING MACHINE TOOLS** is the convenient grouping of all of the operating levers and handles, thereby permitting the attendant to make necessary changes with rapidity and ease. This is one of the little details of construction which conduces not a little to the large capacity for work of our machine tools, as well as to the comfort of the operatives.

PULLEYS and SHAFTING. Boring Mills Bending Rolls, Bolt Cutters, Cranes, Lathes, Planers, Slotters, Punches and Shears, Mechanical Stokers Turn-Tables, Testing Machines, Etc. **INJECTORS for ALL SERVICE.**



Chucks for Taper Shank Drills, with provision for conveying Lubricant to Cutting Lips.

By the use of these Chucks drills of this type can be used in an ordinary drill press, the lubricant being supplied by a small rotary pump.

The sleeves of these chucks being packed with cupped leather packings are tight and do not leak the lubricant under pressure.

To secure the full advantages of this system of drilling, the lubricant should be supplied under considerable pressure, which the construction of the chuck illustrated admits.

Made for Nos. 2, 3, 4, 5 Morse Taper. Prices on application.

The T. & B. Tool Co., Danbury, Conn., U. S. A.

FRICTION CLUTCHES FOR ALL PURPOSES.

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GEAR WHEELS AND GEAR CUTTING
of every description.
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Send for Catalog.

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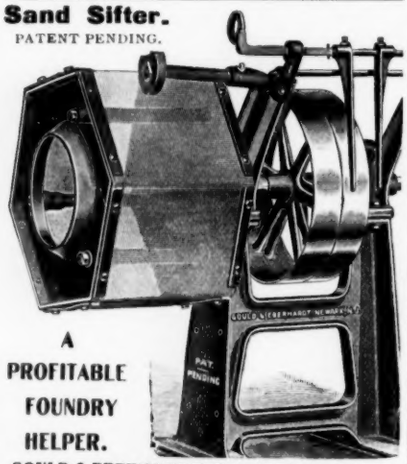

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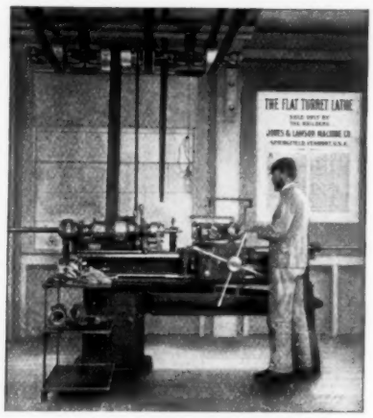

THE FLAT TURRET LATHE
Does Lathe work accurately up to 2 in. diameter by 24 in. long. JONES & LAMSON MACHINE CO., Springfield, Vermont, U. S. A. English Offices; Room 6, Exchange Building, Stephenson's Place, Birmingham. G. H. Pond, Manager; and 26 Pall Mall, Manchester, in charge of Henry Kelley & Co. Germany, Belgium, Holland, Switzerland and Austria-Hungary M. Koyemann, Charlottenstrasse, 112, Dusseldorf, Germany.

The Acme Machinery Co.

CLEVELAND, O.,

Manufacturers of
Acme Bolt and Rivet Headers.
Acme Single, Double and Triple Automatic Bolt Cutters. *Cutting from 1-8 in. to 6 in. diameter.*
Also Separate Heads and Dies.

The Ball Bearing Co.,

12 Watson St., Boston, Mass.,

Have a remedy for that tired feeling coming from the loss of profits due to friction losses on bearings.

'Twould be well to consult them before the case becomes chronic.

TEETH PLANED TO EXACT CONE LINES
TOOTH CURVE GIVES ROLLING CONTACT

BEVEL GEARS

GLEASON TOOL CO. *2 in. to 16 ft.*
6 RACE St. ROCHESTER, N.Y.

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High Grade Machine Tools.

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